



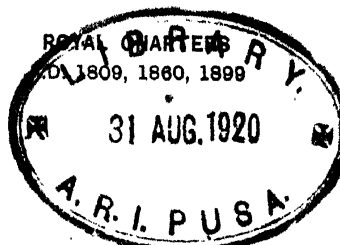
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NOTICE TO BINDER.

Volume XLV. has been issued in two parts, each containing the 'Journal' proper, paged with Arabic figures, and 'Extracts from the Proceedings,' paged with Roman figures. This title and contents sheet should be placed first, and be followed by pages 1 to 154, and then by pages 155 to 422. After that should come the 'Extracts from the Proceedings,' pages 1 to lxiv and lxv to cli, concluding with the General Index.



FIG. 1.—VARENNES.

[Frontispiece.]

JOURNAL

OF THE

ROYAL HORTICULTURAL SOCIETY.

VOL. XLV. 1919.

PART I.

OUR SOLDIERS' GRAVES.

By Capt. A. W. HILL, Sc.D., M.A., F.L.S.

(Botanical Adviser to the Imperial War Graves Commission.)

[Read February 25, 1919] Mr. A. W. SUTTON, V.M.H., in the Chair.]

; Even throughout life, 'tis death that makes life live,
Give it whatever the significance.

THE Graves Registration Commission has had many spheres of activity besides the special department with which I am more directly connected.

Its chief concerns have been the finding, marking, and registration of the graves of officers and men who die on active service.

The details of the gradual growth and building up of the Graves Registration Commission have been so well given by Lt.-Col. G. H. STOBART in the Quarterly Journal of the United Services Institution for May 1917, that it is unnecessary to deal at length with the matter here. It must never be forgotten, however, that our nation owes to the unexampled generosity of the French the possession in perpetuity of the plots of ground where British cemeteries have been established. The French passed a law at the close of 1915, by which, having assumed the necessary powers, they undertook to purchase all such plots and present the "right of enjoyment" of them as a free gift in perpetuity to the British Nation, the British Government on its part making itself responsible for their maintenance. To quote from the paper to which I have referred: "The fact of this magnificent gift, the degree of generosity which prompted it, and the spirit in which every

suggestion put forward by the Graves Registration Commission was met by the French Government, are too little known to the general public of this country." Similar concessions have been generously granted by the Belgian and Italian Governments.

One very beneficial result of this law was that it allowed of the formation of authorized cemeteries immediately behind the line in which properly arranged burials could take place, and the practice of making isolated graves has in consequence gradually ceased.

Soon it was realized that in connexion with the work of the Commission both during and after the war, many questions would arise which could not be dealt with effectively by a branch of the Army; it was therefore decided to form a representative Committee to be called "the National Committee for the Care of Soldiers' Graves" to take over from the Army at the end of the war the completed records and general administration of the work, and H.R.H. the PRINCE OF WALES consented to become President of the Committee.

This Committee was duly recognized by the French authorities, and the self-governing Colonies and India appointed their representatives.

The whole question of the care of soldiers' graves came before the recent Imperial War Conference. As a result of the deliberations of that body the Imperial War Graves Commission was constituted by Royal Charter and now forms the permanent body to whose care the maintenance of our military cemeteries in France, Belgium, Italy, and elsewhere will be entrusted.

Though my title might suggest that I intend giving a detailed account of all the activities of the Graves Registration Commission—and a very interesting story it might make—it is within my province to refer only to that side of the work with which I have the honour to be intimately associated.

The Horticultural, together with the Architectural side of the work of the Commission, may be regarded as the final, and, we hope, the crowning portions of that work, since to the architects and horticulturists is entrusted the proper designing and planting of our cemeteries, so that they may serve as worthy and permanent memorials for all time, to those who have so gallantly laid down their lives for their countries and Empire.

It was only in the early spring of the year 1916 that it became possible to organize a definite scheme for beautifying our graves and cemeteries in France. Previous to this there had been individual efforts in some of the cemeteries at the Base on the part both of French and English to make provision for the care of the graves of our soldiers, and to these pioneers we owe a great debt of gratitude. Now with a Horticultural Department carefully organized, working in conjunction with a body of skilled and well-known architects, the planning and planting up of our cemeteries is proceeding in an orderly and regular manner. The funds for this gardening work during the war were supplied by the Joint War Committee of the British Red Cross Society and the Order of St. John.

While the war was in progress the horticultural work occupied the attention of three officers, and at the present time six officers are engaged in the work of planting and making beautiful our cemeteries in France, and one officer is similarly engaged in Italy.

In addition there is a staff of non-commissioned officers, foremen gardeners, all of whom have an expert knowledge of gardening and have held important horticultural posts at home before the outbreak of the war; and a large body of gardeners. There are also a certain number of women, who have been doing good work on a few cemeteries at the Base.

So far my remarks have related to the French and Italian fronts, but equal care is being or will be taken elsewhere; in Egypt, for example, the care of our soldiers' graves is being undertaken by the Horticultural Department of the Egyptian Ministry of Agriculture.

Horticultural work in our cemeteries in France is attended with several practical difficulties. In the first place, we are confronted with the French law which permits of only three square metres of ground being taken for each burial, and which also enacts that trees shall not be planted nearer than two metres, or hedges nearer than half a metre, to the boundary of a cemetery. Then the burials have often had to be very close together, so that there is not much space left for bold treatment; the paths also are perforce rather narrow, and only simple plans for horticultural treatment are possible.

To the French authorities, however, our sincere thanks are due for the spirit in which they have met us in our difficulties, and for the way in which they have been ready to do all they could to fall in with our requests for the adjustment of boundaries, so that it should be possible to prepare a more adequate and dignified design.

In order that the conditions under which we have to work may be better understood it is necessary to refer briefly to the two methods of burial which have been followed in our cemeteries. In some, and this is usually the case in the Base and also in many of the smaller frontal cemeteries, the burials are in separate graves and each one is made up into a large mound of earth, the cross or other symbol * being placed at the head of the grave (figs. 4, 5, 6). In other cemeteries, more especially those attached to Casualty Clearing Stations, near places where heavy fighting has taken place, burials are in trenches because there has not been sufficient time to allow of individual graves being dug. In such trench cemeteries the actual resting-place of each man is marked by the cross or other appropriate symbol, and the surface of the trench, when finished, is made up into a long smooth continuous mound or border (fig. 1).

In large cemeteries several such trenches lie parallel to one another, separated by narrow paths.

Wherever possible the graves and trenches face the east, but in

* For Jews each grave is marked by the double triangle on an upright stake—the sign of David—and Indian graves are marked by a simple stake bearing the inscription,

some cases where trench burial is the method adopted, it has been necessary to make double trenches (figs. 2, 3). Where this arrangement exists, the crosses are placed down the middle of each double trench area, back to back, leaving a space between the two rows which can (if required) be planted with a dwarf hedge of roses or flowering shrubs.

I may allude here to one trench cemetery in particular where all lie facing the east, the officers being buried to the east of their men. Thus are they still in position at the head of the great army ready to lead their men once again when the final call shall come.

Cemeteries, as may well be imagined, vary greatly in size, character, and situation. Those near important Base Hospitals have, as a rule, reached large dimensions, as have also those formed in connexion with Casualty Clearing Stations or Field Hospitals near the front, where the line remained more or less stationary for a considerable time. In other cases cemeteries may be found which it seemed probable at the time of their formation would have to accommodate a large number of burials, but which, owing to an advance, were left far behind the lines and now contain only a few graves. Such small places, the number of which is considerable, afford many difficult problems, not only in connexion with the adjustment of land claims, but also in relation to questions of design and horticultural treatment, since it is far less easy to plant adequately a small site than a large one, and there is little scope for any boldness in design.

Mention must further be made of the many French Communal cemeteries where we have been permitted to bury our men. Examples of this type will be found in many villages and towns. In some places separate plots have been assigned to us, but in others there may be only a few of our graves scattered among those of the civil population. In all such places we are limited in our efforts by the French Communal regulations, but, as a rule, thanks to the kindly sympathy and co-operation of the Mayors, we are being allowed to carry out our own ideas as to treatment, despite the fact that they are usually very markedly different from those considered appropriate for cemeteries by our French Allies.

As may well be imagined, the present condition of the different types of cemeteries to which I have referred depends very largely on their position with reference to the recent scenes of active operations. In the area of the Lines of Communication it has been possible to carry out a good deal of work of a more or less permanent character, including the planting of trees and shrubs and the sowing of grass lawns.

In cemeteries towards the front, very little permanent work has as yet been possible, partly because they have been so recently in active use, and there has not yet been time to prepare a definite design for permanent treatment, and also partly because there is not yet a sufficient staff of men available for any work beyond that of keeping such places neat and tidy.

Despite these difficulties, however, the majority of our forward cemeteries present a remarkably well-ordered appearance, and great credit is due to the men in whose charge they have been placed. It has been our aim in all such cemeteries to produce as good an effect as possible by simple means, chiefly by the sowing of annuals and grass and by the planting of bulbs, and certainly, during the spring and summer months, the results have amply repaid the labour that has been expended on them.

That work such as this is appreciated at home we know well, but it has been even more appreciated, we believe, by our men in France. It was seldom that one could visit a military cemetery without finding several of our soldiers there examining the names on the crosses; and the moral effect of a well-ordered cemetery, bright with flowers, was, we understand, considerable. This perhaps is hardly a matter for wonder, as our cemeteries and the garden plots surrounding Clearing Stations or Field Ambulances were often the only bright and neatly kept spots in the midst of the prevailing desolation.

A large number of cemeteries were, of course, well within range of enemy guns, and in these horticultural work was scarcely possible; grave-digging often could only be carried out after dark and any work that was done was liable to destruction. Even cemeteries so situated, however, were not left bare and desolate—bags of seed of mixed annuals were sent to our officers in forward stations for distribution amongst their cemeteries, and these in the summer made a very effective display. In addition the graves have often been planted with small shrubs, herbaceous plants or box—brought in from derelict and abandoned gardens by the cemetery men—which have relieved the barrenness of many a wayside burying-ground in Flanders.

One of the chief difficulties connected with our work is concerned with the nature of the soil in the cemeteries. The sites are naturally chosen for their convenience, and it is, as a rule, a matter of accident rather than design should the soil happen to be favourable or the site one of particular natural beauty. Despite this, however, many a cemetery is remarkably beautiful either in itself, as when situated in some old country orchard (fig. 6) or in a wood, or alongside a copse, or on account of some commanding view which it gives towards the sea or over a wide expanse of river valley or open country.

The Italian front offers a great contrast to France. Not only are our cemeteries on a smaller scale, but for the most part they are in very beautiful positions, and afford the most varied possibilities for interesting horticultural treatment. Those in the Riviera and at Taranto will be planted with plants of a sub-tropical character, such as flourish in Lady HANBURY's beautiful garden at La Mortola.

Perhaps the most beautifully situated of all our military cemeteries in Italy is the one at Bordighera. It is surrounded by groves of date palms ascending the hills, and by fields of carnations, and to the south commands a view over the sea; when planted and completed it cannot fail to be a very lovely spot.

The cemeteries in the Asiago Mountains afford a remarkable contrast, with their fine bold masses of limestone and forests of fir trees. But little effort will be needed to convert each cemetery into a small rock garden and to establish in them the Saxifrages, Cyclamen, Gentians, and other alpine plants that flourish amongst the rocks close at hand. Thanks to the care of one of the Padres on this front, several of these cemeteries are already in excellent condition and planted with ferns and Saxifrages.

The Piave and Montello cemeteries are more like those of Northern France, and with the exception of those at Montecchio and Giavera have no particular natural beauty.

Neither in the cemeteries of the Venetian plain nor in those of the Riviera will it be possible, we fear, to grow grass as is being done in France, but dwarf rose bushes, Iris, and other carpeting plants will grow freely, and as good stone is also abundant it will not be difficult to plant and put in good order our graves behind the Piave front.

In the cemeteries of the Riviera group, and in those of the plain, we intend planting, wherever possible, the Italian Cypress, *Cupressus sempervirens* var. *pyramidalis*, perhaps the most suitable of all trees for the purpose and one which is such a typical and beautiful feature in every Italian landscape.

In Northern France the soil is one of the principal factors that have to be taken into consideration, for we have for the most part to deal with loam of varying depth, overlying chalk. In the fenland of the north within and near the Belgian frontier, the soil is usually good, though the sites may not be very attractive. In places where there is a good depth of loam the possibilities of successful planting results are assured; but often the surface soil is shallow and any planting work is attended with considerable difficulty. It is also unfortunate that there are very few places where Rhododendrons, Azaleas, and heaths can be grown with much chance of success, though very good results have been obtained at Boulogne.

In all cemeteries where the chalk is near the surface, there is the further trouble that in grave or trench digging a great quantity of the underlying chalk has been brought to the surface and, where special precautions were not taken, the good top soil has often been buried. When therefore permanent planting work is undertaken, a great deal of labour is involved in removing the chalk or other bad soil and replacing it with suitable earth. After the appointment of the horticultural staff, precautions were taken to set aside, wherever possible, the top layer of soil and to replace this on the surface after the graves had been filled in, but in the forward cemeteries careful work of this nature was seldom practicable, and the bad soil will have to be replaced when the work of their permanent planting is taken in hand.

In the important base cemetery of St. Sever, Rouen (fig. 3), where the subsoil is river gravel and sand with a thin surface soil of good agricultural earth, the sand and gravel had been brought to the surface

in the course of the earlier grave-digging operations, and all the good soil was buried owing to the lack of adequate supervision in the first year of the war. The site is open and liable to be scorched by the sun, and in this dry yellow gravel it was almost too much to expect plants to grow with any success. The sand and gravel, therefore, had to be removed and good top soil from a neighbouring field, mixed with manure, had to be put in its place. The cemetery being a large one, the work entailed was very heavy, but the results have amply repaid the effort, and in the summer this cemetery is now a quite beautiful garden.

The cemeteries which have afforded some of the most difficult problems are those near the sea, where the soil consists wholly or partially of blown sea sand. The two paramount difficulties in such places are the retention of the shifting sand and the finding of plants and grass suitable to such conditions. To overcome the first, wind-breaks have to be erected, inside which a screen of trees and shrubs can be raised which shall in time break the force of the prevailing wind—just such work in fact as has had to be done in works of coast defence, both at home and abroad. Then, when a fairly still area has been produced within the bounds of a cemetery, the planting problems can be faced. It is somewhat surprising to find that on the whole the sand is remarkably fertile, and it may, I think, be confidently anticipated that good results will be attained in such places in course of time.

With a shelter belt of Maritime Pine, Bolles' Poplar and Sycamore underplanted with Willow, Sea Buckthorn, and Privet, a beautiful and efficient wind-screen should be possible. In the cemetery at Étapes—one of the largest in France, which is skirted by the main line from Boulogne to Paris—the beautiful effect of Maritime Pines, retaining the banks of blown sand, is a conspicuous feature (fig. 5).

In this cemetery, until more efficient shelter can be established against the cutting winter winds, it is only possible to grow annuals, for even should there be any plants which the winter wind, charged with sand, does not cut to pieces, they are promptly eaten by the rabbits infesting the sand-hills. In the summer, however, a very beautiful effect has been produced by using for the most part blue, mauve, and white annuals, such as *Nemophila*, *Phacelia*, mauve and white *Linaria*, Single Asters, *Alyssum*, &c. These, with the background of the yellow earth, the pine-clad sand-hills and the distant view over the blue waters of the estuary, produce a picture whose beauty it will not be easy to forget. Grass is now being sown here to form the main ground-covering, but some time must elapse before the whole area is converted into a smooth green lawn.

That grass can be grown in such spots has been amply demonstrated, provided that time and sufficient labour be allowed; for around many a hospital near by, on exactly similar soil, lawns have been produced which would be the envy of many a seaside town at home. In all such places the inborn love of gardening, so character-

istic of our people, is very much in evidence. In the cemetery at Wimereux, where the soil consists entirely of blown sand, grass is growing well, and a very effective display has been produced there by the mauve flowers of *Nepeta Mussini* which, when in flower, makes a beautiful contrast to the sandy surroundings. In this same place, an avenue or alley-way of *Cotoneaster frigida*—with Sycamore to help as a wind-screen—has been planted, and should form an interesting feature, especially when covered in the autumn with its scarlet berries.

Here, and in many other cemeteries, the common flag Iris is an invaluable plant, and it appears to be as happy when growing in blown sand as it is in a stiff loam. This happens to be one of the plants appropriate for the graves of Indian soldiers, and wherever possible we are planting on or around their graves Iris, Marigolds, and Cypress, all plants which they regard as sacred and appropriate for cemeteries.

This leads me to mention that we are attempting to plant, in cemeteries where men from our Overseas Dominions lie buried, trees, shrubs or other plants characteristic of the countries whence they came to the defence of the Empire. In memory of the Canadians we have raised Maples, native both to the east and the west coasts of Canada, from seed specially sent to Kew from Canada. For the Australian graves, a large number of seedling Tasmanian Eucalyptus trees * (*E. Gunnii* and *E. whittinghamensis*) have been sent to France from Kew, which we hope may prove hardy in Northern France; while, for the graves of those who came from the Dominion of New Zealand, a quantity of cuttings of the Daisy Bush (*Olearia*) and *Veronica Traversii* have been struck at Kew, and have been sent to one of our nurseries in France for transplantation in due course to particular cemeteries.

I may mention that, like the French, we are using such perennial plants as the old-fashioned double white Pinks, London Pride, mossy Saxifrages, Cerastium, and Thrift for borderings to our graves and trenches, while Polyantha Roses, Lavender, Rosemary, Iris, perennial Iberis, small heaths &c. are planted where possible at the foot of each cross.

To mark with characteristic plants the graves of all the representatives of our Empire is, however, in these northern climes unfortunately impossible. South Africa, except by annuals, can have no permanent commemorative plant; nor, alas! can we show our respect, by any floral emblem, to our West Indian, West African, Malayan, and other Colonial soldiers who have fought and died in France.

For them, as for all, the grateful memory of their sacrifice in a great cause will ever remain enshrined in our hearts:

" Their bodies are buried in peace
But their name liveth for evermore."

* The seeds were very kindly sent to Kew by Miss BALFOUR from Whittinghame and by Mrs. BATEMAN of Brightlingsea, near Colchester.



FIG. 2 — BUILT EUL.



FIG. 3. FORECAST



Table 9.

FIG. 5 - ÉTAPLES

I have so far referred only to those who lie buried in our well-ordered cemeteries, but it must not be forgotten that there are many who have been buried where they fell on the great Somme battlefield of 1916. The identification and reverent burial of those who fell in that great advance has been a great task finely achieved. Each grave has been surmounted with a white cross and enclosed with a wire fence. When I visited the region in July 1917, the whole of that desolate shell-hole region was transfigured and glorified by the common scarlet poppy, and the sight was more beautiful than any words of mine can express.

FLANDERS' FIELDS.*

In Flanders' Fields the poppies blow
Between the crosses, row on row,
That mark our place, and in the sky
The larks still bravely singing fly,
Scarce heard amidst the guns below.
We are the dead. Short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved; and now we lie
In Flanders' Fields.

Take up our quarrel with the foe,
To you from failing hands we throw
The Torch—be yours to hold it high;
If ye break faith with us who die,
We shall not sleep, though poppies grow
In Flanders' Fields. (Lt.-Col. John McCrae.)

Picture to yourselves a vast undulating landscape, a blaze of scarlet unbroken by tree or hedgerow, with here and there long stretches of white Chamomile and patches of yellow Charlock, dotted over with the half-hidden white crosses of the dead.

Smaller patches of Charlock were often conspicuous, and these usually marked the more recently dug graves where seeds, doubtless long buried, had been brought to the surface.

In no cemetery, large or small, however beautiful or impressive it may be, can the same sentiments be evoked or feelings be so deeply stirred. Nowhere, I imagine, could the magnitude of the struggle be better appreciated than in that peaceful, poppy-covered battlefield, hallowed by its many scattered crosses.

Not all who perished on that battlefield have been identified, but a cross stands at the head of every grave, sometimes bearing the inscription to "an unknown British Soldier."

For "Some there be who have no memorial; who are perished as though they had never been."

"Splendour unfading for their land they won,
And then the shadowy robe of death put on.
Yet died and are not dead; for their brave might
Fames, and uplifts them from the realms of night."†

* Printed in *Nature*, Feb. 21, 1918, p. 488, in the obituary notice of the author, Lt.-Col. John McCrae of the Canadian Army Medical Corps—also a Canadian poet. He published war poems in *The Spectator* and in *Punch*.

† Simonides' Epitaph on the Lacedæmonian Dead at Platæa, translation by the late Dr. Walter Headlam, published in his *Book of Greek Verse*, p. 47. Cambridge University Press, 1907.

With regard to the permanent work in our cemeteries, it is necessary in the first place to protect them so that their sites shall not be obliterated in course of time, and to this end it is intended, wherever possible, to enclose them with a wall. Either within or without the wall a hedge of Thorn, Beech, Hornbeam, Yew, or Holly may be required, or a screen of pleached and trained Limes or Hornbeams to surround the cemetery—similar to those so often seen in France—may form a feature of the design. Within the cemetery itself, it is intended to rely mainly on the peaceful effect of a smooth grass lawn with each grave marked by its headstone, and to plant avenues and groups of suitable trees or shrubs.

In many places a small rose bush or other dwarf shrub has been planted on each grave, but as these cannot be expected to live for many years, it will be far more effective to aim at establishing eventually an even and unbroken surface of turf.

Before grass can be sown, much work will have to be done in producing a levelled surface by lowering the unsightly mounds of earth over the individual graves and by erasing the innumerable narrow pathways. In trench cemeteries the trench mounds are being similarly lowered and the narrower paths are being filled in in order to prepare a smooth surface for the grass seed.

A grass lawn which can be rolled and mown presents no special difficulties for permanent maintenance, but the keeping neat of a large number of small grass plots, which would have to be cut by hand, affords a problem beset with so many difficulties, especially when the number of the cemeteries is taken into consideration, that it must be put aside as impracticable.

Now that the work of permanent planting has become possible it has been found necessary to establish nurseries for the reception and propagation of the trees and shrubs destined for cemeteries. The plants have been or are being obtained from several well-known French and English nurserymen, and are set out immediately on arrival in one or other of the nurseries, there to wait until they are required for the places for which they were ordered. The first consignments, four in number, were received in the autumn of 1917 and each nursery was supplied by a different firm in order to obviate any confusion.

It was hoped that as the destinations were far apart and the firms distinct, the consignments would arrive at reasonable intervals. As it happened, however, three of them arrived at almost the same time, and to give you an idea of the work this entailed in war time I cannot do better than quote a portion of a letter I received from one of our horticultural officers in France telling me of the arrival of these 56,000 plants, which were unloaded and planted or heeled-in in six days.

“ Things have indeed moved during the past week.

“ On Monday last I started for M—— and called at the R.T.O.'s office to inquire if anything had come, and found it had.

“ I went to the S.M.T.O. and asked for transport and he placed

a lorry at my disposal in half an hour. In two loads we had everything at the nursery and began heeling-in.

"On the morrow I took the corporal down and we checked it all. By 3 P.M. we had got everything into temporary quarters. The men have orders now to plant out properly all the small stuff, only leaving the big standards heeled-in. I left them about 3 and came on to H.Q., where I learnt that the consignment from Barbier had arrived at D—— and was being hauled. [This latter place is distant some 100 km. from M——.]

"I ran down there next morning and got things working properly and spent that day and the next in counting and checking while the men were planting out and trenching. In the evening I went to V—— [some 20 km. away], and though it was nearly dark I went across to the railway sidings and hunted up a sergeant-major and inquired about a truck from Paris. He said he thought there was one newly arrived, so I told him to get it along to the nearest spot to the cemetery to which a lorry could come, and this he promised to do.

"Then I went to the R.T.O. at A—— and found that the truck was on their sidings. In black dark and driving rain I stumbled over wastes of sidings till I found the truck and made sure that our own box cars could not haul it; so I had to find transport.

"I went to the Sucrerie, got a lorry at 8.30, but on going out to the sidings I found the truck in a place approachable by nothing less than a tank!

"So I raced off down the line till I found an engine—seized it and ordered it to come with me. It came along, hitched on to the truck and steamed off to where I had the lorry waiting.

"Then ensued a day of pure misery; rain, half a gale, and mud in endless and increasing quantities. But we got the truck unloaded in five trips by 3.30. I then sent the men into their hut and rushed back to D—— to supervise the planting work there.

"I found things running in a bath of oil. The sergeant pruning, our men planting, and planting well, and four men trenching the ground. Everything underground and safe from frost, and the whole place taking shape and order. A sight for sore eyes.

"Next day I got back to H.Q. in time for lunch and a change. I was wet and had been wet for two days, but I am quite fit and all goes well."

Many of these plants were put out in the cemeteries, and many were being retained for planting out later; but unfortunately two of our original nurseries fell into the hands of the enemy last year and all the plants were destroyed by shell fire. Many of the cemeteries too, where a considerable amount of planting of roses, hedges, and trees had been carried out, also fell into the enemy's hands and most of our work was destroyed during the great struggles and devastating fire of the advance and retreat. The destruction of work on which so much time, thought, and careful labour had been bestowed must, no doubt, be reckoned among the fortunes of war, but nevertheless

it is a great disappointment to those to whom the work had been a labour of love. Though the loss and disappointment has been considerable, the damage has now been largely repaired, the cemeteries have been put into proper condition, new nurseries have been made, and further supplies of plants have been acquired for planting the cemeteries.

I have already mentioned that we are indebted to the British Red Cross Society and Order of St. John of Jerusalem for the funds which have made it possible to carry out the work already accomplished, and to those organizations we shall continue to look for the financial assistance necessary for carrying out all our temporary horticultural work in cemeteries in the Mobile Army areas. For the permanent planting and upkeep, however, the recently established Royal Commission will make itself responsible.

In addition to our grants from these sources we have also to acknowledge the receipt of many kind presents of bulbs, plants, and seeds which have been made by private individuals and by firms for general purposes in our cemeteries, and to all such donors we are very greatly indebted. Owing to innumerable difficulties of transport &c. it is almost impossible to permit gifts of plants for individual graves to be made.

Our one endeavour is to make these sacred plots—those fields in Flanders that are “for ever England”—worthy memorials to those who have given their lives in the cause of liberty and for the safety of our Empire. No wiser means of ensuring the attainment of this ideal could have been devised than the establishment and organization by H.M. the KING of the Imperial War Graves Commission on the application of H.R.H. the PRINCE OF WALES. His Majesty's nomination of His Royal Highness as first President of the Commission is a further good augury that the task entrusted to the Commission will be carried out in a manner worthy of the great cause.

EXPLANATION OF PLATES.

All the photographs were taken in July 1917.

Fig. 1. A portion of the cemetery at Varennes, near Acheux. The burials are in trenches and the photograph shows the trenches covered with mixed dwarf annuals. As this cemetery was not very far from the line when the photograph was taken in 1917, it was not possible to sow annuals in any definite colour scheme.

Fig. 2. A view in the cemetery at Bailleul. The burials here are in double trenches. The space between the cross was sown with taller annuals, such as Sweet Peas, Malope, Cornflowers, dwarf Sunflowers, &c. On the graves were long stretches of annuals, each stretch being of one kind and separated from the next by a broad band of grass or mignonette. The annuals were bordered by a broad verge of grass.

Fig. 3. St. Sever, Rouen. The trenches here are double as at Bailleul and sown with stretches of dwarf annuals separated by hedgerows of taller annuals between the crosses. Grass is now being sown as a general ground covering and a rose bush planted at the foot of each cross. The hedgerows are being planted with Yews, Persian Lilac, *Berberis stenophylla*, *Philadelphus Lemoinei*, Roses etc., each hedge being of one kind of plant.

Fig. 4. Forceville. About one-third of the grave area next the cross is sown with dwarf annuals, such as *Alyssum maritimum*, Candytuft, pink Eschscholzia, &c., the other two-thirds being grass.

Fig. 5. Etaples. The cemetery is screened from the road by the bank of blown sand covered with the Maritime Pine. The soil of the cemetery is sticky clay over chalk and covered by sand. As the prevailing ground colour is yellow, the annuals used were mainly blue, mauve, and white, such as *Alyssum maritimum*, mauve and white Linarias, Phacelia, cream Eschscholzia, single mauve and white Asters, &c.

Fig. 6. Couin. The cemetery is in a beautiful apple orchard. All the graves are separate and sown with annuals near the cross, the rest of the grave being covered with grass. The annual Chrysanthemum 'Morning Star,' mauve and white Lychnis, *Alyssum maritimum*, Godetia, branching blue Larkspur, *Toxotes pumila* and other annuals made a beautiful display here.

PRITZEL'S "INDEX."

By B. DAYDON JACKSON, Ph.D., Gen. Sec. L.S.

[Read January 28, 1919; Capt. A. W. HILL, M.A., D.Sc., in the Chair.]

I HAVE been honoured with an invitation to say a few words this afternoon upon "Pritzel, and the necessity for a Revision of his work, and the call on all Horticulturists to support it."

There are two aspects of a discourse such as this: First, the author may have chosen his own subject, one which he has specially studied, and in which he hopes to enlist the interest of his audience, presumably less informed on it than himself; and second, where the author has been provided with a subject in which many of his audience are interested already, some being possibly as well acquainted with it as himself, while a few may even excel him in that point. In the latter case, the speaker has a claim on the forbearance of his audience.

In the first place, who was the author? GEORG AUGUST PRITZEL was born, as Mr. GERALD LODER reminds us in the *Gardeners' Chronicle*, at Carolath, in Silesia, on September 2, 1815. The obituary notices give practically no details of his life, but from the "Allgemeine Deutsche Biographie" we learn that he grew up in poor circumstances, until at the age of 36 he secured an appointment as assistant in the Royal Library, Berlin. This was in the year 1851, which witnessed the completion of his well-known "Thesaurus literaturae botanicae omnium gentium" (the treasure of botanic literature of all nations), which was issued in parts from 1847 to 1851. It looks, therefore, as if the issue of this important work drew attention to his merits and gained him the appointment in question.

How he maintained himself during the period between the completion of his academic training and the publication of the first part of his "Thesaurus" seems to be unrecorded. We get a glimpse from the fact that in 1843 SCHAUER and WALPERS independently proposed *Pritzelia* for genera which have not been maintained; this recognition of Pritzel's merits is presumably due to the publication of his "Anemonarum revisio" in the year previous, from the journal *Linnaea*.

Four years afterwards his second important work, and that which specially appeals to this Society, came out: his "Icones Botanicarum Index Locupletissimus; Verzeichniss der Abbildungen sichtbar blühender Pflanzen und Farnkräuter aus der botanischen und Gartenliteratur des XVIII. und XIX. Jahrhunderts in alpha-

betischer Folge zusammengestellt" (a complete guide to botanic illustrations; a catalogue of flowering plants and ferns from botanic and garden literature of the 18th and 19th centuries), Berlin, 1855. A spurious second edition, with slightly altered title-page and preface rendered into English, is to be found, though repudiated by the author; it was probably a trick of his publisher, Nicolai, to sell the remainder of the stock. A thin second volume came out in 1865 bringing the references down to 1865, and that is how the matter still stands.

Mr. LODER thinks that the main work was probably compiled at the same time as his "Thesaurus," but I do not feel quite sure of that; it is possible that when he had printed his author-list by 1849, he may have entered upon the preparation of his second book, especially as the printing of his "Thesaurus" was not very rapid; still, the actual period of his work on this subject need not detain us. It may be noted that the year when his "Index" was published, 1855, was marked by his becoming "Archivar" to the Royal Academy of Sciences in Berlin, so that his two important books marked two important steps in his life. A second edition of his "Thesaurus" was taken in hand (presumably after he had completed the supplemental Index of 1866); this was altered in plan by omitting many of the entries of gardening books which had their place in the first issue, and naturally by including recent books, those published between 1847 and 1870, with some particulars of the authors, in a very useful fashion. Unhappily he did not live to finish this edition; the first four parts bringing it down to "Tournefort" were brought out in 1872, when the painful spinal disease from which he had suffered during many years made it impossible for him to continue. He died on June 14, 1874, at Hornheim, near Kiel. Dr. C. F. W. JESSEN was entrusted with the task of seeing the rest of the manuscript through the press, and of compiling the subject entries; the final part, comprising three fasciculi in one, came out in 1877.

Turning now to the volume on which I am called to speak, the names of genera and species are arranged in alphabetic order as printed in the books cited, and as explained by the author in his preface thus: "The compilation of a work, for which there was no prototype extant in botanical literature, was accompanied by many difficulties. The greatest possible completeness was the main essential; to what extent I have attained this requisite I have been informed by very gratifying testimonials from several monographers. Those whose studies have enabled them to take a comprehensive survey of botanical literature will not be surprised to hear that, in spite of my desire for completeness, I have nevertheless been obliged to reject more than 100,000 delineations as worthless. That amongst this large number there must have been many which would have been useful to some one or other, who would make use of this book for his own special purposes, is as little to be denied as that,

on the other hand, a considerable number have been enumerated which to others, more particularly to thoroughly scientific botanists, will appear superfluous. The various claims have been subjected by me to careful examination, and I have endeavoured to be just to each according to the measure of its apparent weight. I doubt very much if anybody desires to become acquainted with the thousands of little pictures of flowers in DEAKIN'S 'Florigraphia,' DENISSE'S 'Flore d'Amérique,' Miss JACKSON'S 'Pictorial Flora,' MORRIS'S 'Flora conspicua,' or LOUDON'S 'Encyclopædia' [of Plants], not to mention still more inferior productions. I cannot, however, avoid looking on it as a defect in my work that single good original drawings in works like LOUDON'S 'Arboretum,' BERG'S 'Charakteristik der Pflanzengenera,' LE MAOUT'S 'Leçons élémentaires,' FRANZ SCHMIDT'S 'Oestreichs Baumzucht,' KERNER'S 'Oekonomischen Gewächsen,' and others, have been passed over without mention. I can only defend this by the consistent carrying out of the principle I had laid down for myself, viz., having once selected a work for reference, to quote it throughout; this did not seem to me advisable to do in the case of the above-mentioned works on account of their containing so many illustrations that could well be dispensed with. When I come to publish a supplement which the appearance of more recent publications will under any circumstances render necessary, I will not fail to remedy this defect by mentioning the representations most worthy of notice contained in the class of works mentioned. On the same occasion also justice shall be done to other plates that have been left unnoticed which are to be found singly in particularly rare works, or in periodicals and in academical treatises that I have not as yet been able to obtain. My numerous friends and correspondents, to whom I am indebted for so much valuable co-operation in my by no means easy task, will, I hope, lay me under fresh obligations by their further assistance in supplying the various omissions they may still discover. For this purpose I will not fail to put before them in the 'Botanische Zeitung' a list of the rare books containing delineations of plants that I have not been able to obtain access to.

"The internal economy of the book was infinitely easier to decide on than the choice of what was to be admitted and what was to be rejected. An alphabetical arrangement, retaining the names under which the drawings had been published, proved itself on examination to be the most expedient method. A thorough correction of the synonyms would have been a labour of many years, and could only have been accomplished by some one of the few thorough systematic botanists that we still possess. To make these corrections in a few thousand instances, which I could have very well done, and to have left the great bulk untouched, would have been, as it seemed to me, a mistake that I congratulate myself on not having committed. It was otherwise with the nomenclature of some authors of earlier date, such as RHEEDE, RUMPF,



FIG. 6.—COUN.

[To face p. 16.

KAEMPFER, &c., in the correction of which existing commentaries and the references of more modern authors did me good service."

I do not think PRITZEL could possibly have done otherwise. Had he tested every name, and corrected the false ascriptions, he might never have ended his task. He was perfectly justified in cataloguing the names of plants as he found them, leaving it to experts to detect errors; his function was to guide enquirers for the scattered figures in a long series of volumes, or detached cuts in special volumes, almost entirely from the time of CARL VON LINNÉ onward. Two great works of pre-Linnean botany were excepted—that is, he included the "Hortus indicus malabaricus" of RHEEDE TOT DRAAKENSTEIN, 1678–1703, and the "Herbarium amboinense" of RUMPFUS, 1741–1755, both of which have determinations of modern names, of the first by A. W. DENNSTEDT and C. W. DILLWYN, of the second by A. W. E. T. WENSCHEL and J. K. HASSKARL respectively, which were at our author's service for citation.

One cannot repress a feeling of regret that, if any pre-Linnean books are to be cited, the noble woodcuts of FUCHS (1642), the Valgrisian edition of MATTIOLI (1565 and 1569), and COLONNA's etchings (1597 and 1616) should be excluded, but the question of renaming and of interpretation becomes a great embarrassment. There is one grave complaint to be brought against PRITZEL's method, and that is, in some cases he has given numbers for plates which are not official; apparently he put numbers to certain copies to which he had access, and quoted those numbers. The result is that his citations as regards these books are useless beyond stating that such figures are to be found somewhere in the volumes cited. As an example let me instance CURTIS, "Flora londinensis," 1777–98 (second edition, by W. J. Hooker, 1817–28), in folio, with admirable plates, but the references in PRITZEL do not help one to turn to the plates. A short time ago I was forced to draw up an index to CURTIS for my own use; it was afterwards printed in the *Journal of Botany*, vol. liv. (1916), pp. 153–164, utilizing the official numbers.

The fact now faces us that no printed record of the many excellent figures published since 1865 to the present day, a period of 53 years, is available. The *Botanical Magazine* has continued its regular and even succession of plates and has brought out a general index down to 1904, when Sir JOSEPH HOOKER retired from the editorial chair. There are now fourteen volumes since that date, and those of us who have to look up botanical plates have perforce to keep an index of them up to current issues.

But this series of volumes is a simple matter; we must remember the large number of periodicals—existing or defunct—separate volumes, publications of societies, a widely scattered literature which needs to be focussed for effective use. This, it is obvious, could be most easily done by a revision and reissue of PRITZEL's "Index." When done, it will be an invaluable help to all who have to determine plants or confirm their naming. Whether in one volume or

two, it will be a master-key to the illustrations in botanical literature of the last two centuries, which can only be consulted by our having the knowledge of their existence and being able to turn to the required plate without a wearisome and irritating loss of time.

The large herbaria, pre-eminently those of Kew and the Natural History Museum, have each a fine series of plates, arranged by natural families and genera. But these collections can only rarely be met with; they are costly to create and to keep supplied with current publications; they also demand much space—more space than any private possessor of a botanical library is likely to be able to spare. Even to these there are limits of accession: it is quite practicable, as at Kew, to paste down on the same sheet the original drawing, the proof, and the published print of each plant figured in the *Botanical Magazine*, or where plates are to be obtained which have a blank on the reverse; but many excellent drawings occur as text-figures with printing on the other side, and that would demand two copies to comply with the requirement now stated. Indeed, this is the case at Kew, where, though the collection of plates is a splendid one, it has been found requisite to keep a copy of Pritzel's "Index" constantly posted up as far as possible.

It is agreed therefore that a new and amended edition of the "Index" is a great and pressing want. The next consideration is, how can this want be met?

I need hardly remind the Fellows that the republication on a modern basis of the work under discussion has been repeatedly raised at the Annual Meetings and discussed at many Councils. It is no secret that funds have been set aside to prepare a new edition, and, with a view to making a start after the conclusion of hostilities, the Council in November 1917 set up two Pritzel Committees—(a) To advise on the amount of information which those for whose benefit the revision will be mainly undertaken would wish the new "Pritzel" to include; and (b) to advise the amount of information which those familiar with the preparation of works of this class consider it may be possible to incorporate. In a Minute circulated amongst the members of these two Committees the above objects are compressed into (a) the maximum of information it is desirable to incorporate, and (b) the minimum of information deemed essential.

These Committees have met, and have shaped out a practicable method, which may roughly be summarized thus:—

All botanical plates are to be cited, and under the names employed by those responsible for the plates, but no attempt can be made to give the right name to a plant wrongly named, for, though possible in a few instances, it could not be applied to all, hence uncertainty would attach to the names cited; but obvious errors other than taxonomic should be put right. The pictures printed in such horticultural journals as the *Gardeners' Chronicle*, the *Garden*, and their foreign equivalents, are to be quoted. Some hybrids are to be included, and possibly some generic cross-references; also

references to plates in Floras where the plants are critically drawn ; but the numberless garden varieties and forms must be passed over. A card catalogue of all entries is being made, and it is suggested that its home should be in the Library of the Royal Horticultural Society as a permanent catalogue, and be there kept posted up. The basis of selection was thus phrased :—

(a) All plates and drawings, whether produced from photographs or not, should be included if accompanied by a detailed scientific botanical description.

(b) All plates, drawings, and reproductions of sufficient botanical, horticultural, scientific, artistic or historical value should be included, even if the botanical description be deficient.

(c) That it should not be considered necessary to include all plates or drawings in a work selected to be cited, but only those which conform to the conditions eventually laid down.

(d) Cross-reference to genera where necessary.

(e) A list of the works cited should be drawn up, with the abbreviations employed, and authorities for the species added.

(f) Dr. STAFF, F.R.S., was appointed honorary editor, to supervise the work which is to be done at Kew by temporary members of the staff.

A summary may be best made by the following extract from the memorandum drafted by the Secretary of the Society :—

" . . . Not only is PRITZEL'S book out of print, but as he finished his work in 1866, and as the last fifty years have been more productive of new plants discovered than any fifty years before, it may be imagined how absolutely necessary, from both the botanical and horticultural points of view, it is to bring PRITZEL'S work up to date. Different scientific bodies, both here and in the United States, from time to time have made suggestions for undertaking this work of revision, but as yet none of their suggestions has taken effect, chiefly on account of the very large expenditure and scientific work it involves.

" The original 'Pritzel,' which must of course be reprinted, contains about 107,000 entries, and it is estimated that at least 125,000 more entries will have to be incorporated with them. Add to this that the above work being all so technical and scientific, and absolute accuracy so necessary, some idea may be formed of what the revision entails. A rough estimate has been given of the cost of preparing the manuscript for the printer, £1,500, and after that there will remain reading the proof—a matter which can only be done by a skilled botanist—and last of all there will be the printing itself, and taking this last item at pre-War figures the total cost will be little, if at all, less than £3,000 or £3,500, and post-War figures may even bring it up to as much as £4,000.

" The Royal Horticultural Society, being the premier horticultural society of the world, has at last definitely undertaken to carry out the work with the assistance of botanists attached to the Royal

Gardens at Kew and at the British Museum (Natural History), South Kensington, and the Linnean Society, and in friendly co-operation with the United States Government Plant-Bureau. On the R.H.S. alone, however, rests the financial responsibility, which has hitherto been the chief obstacle in the way of this absolutely necessary international scientific publication. Anyone unacquainted with PRITZEL'S work can form some idea of its paramount importance by considering that if he wanted to find a picture of some rare plant he might hunt through the British Museum library for a week, and then perhaps not find it, whereas with 'Pritzel' at hand to refer to he would find it in one minute.

"In 1913 the R.H.S. began to raise the required amount, the International Horticultural Exhibition held in 1912 starting the Fund with a donation of £250, followed by £100 from the Veitch Memorial Trustees, and the Council of the R.H.S. voted £250, to which the Council have since added another £250 to enable the work to be begun. The work has now been actually started, the typists having accommodation found for them, through Sir David Prain's kindness, at Kew, and the whole is under the immediate supervision of the following Committee, viz. Professor I. Bayley Balfour, F.R.S., V.M.H.; Mr. E. A. Bowles, M.A., V.M.H.; Mr. F. J. Hanbury, F.L.S.; Captain Arthur W. Hill, M.A., F.L.S.; Dr. B. Daydon Jackson, Ph.D., F.L.S.; Mr. Gerald W. E. Loder, M.A., F.L.S.; Sir Daniel Morris, K.C.M.G., J.P., V.M.H.; Sir David Prain, C.M.G., C.I.E., F.R.S., V.M.H.; Dr. A. B. Rendle, F.R.S., V.M.H.; Dr. O. Stapf, F.R.S.; Sir Harry J. Veitch, V.M.H.—to which, as has been said, will be added direct assistance from Kew, South Kensington, the Linnean Society, and the U.S.A. Plant-Bureau.

"It now remains to collect the remainder of the finances required, and the Council hope that everyone, whether a Fellow of the Society or not, who is interested in plants botanically or horticulturally, will make some contribution to a work which for the next 100 years at least will be the standard work of the kind, and will form the basis of a future similar revision by our grandchildren or great-grandchildren in the next century.

"It is proposed to publish the names of all subscribers of £1 is. and upwards in the Introduction to the new work, so that they may be known to those who come after as those to whom the new 'Pritzel' is due."

Nearly forty years ago I seriously entertained the project of revising PRITZEL'S "Index," and discussed it with a well-known botanical bookseller and publisher. He dissuaded me from the project by pointing out that there was then no scarcity of copies, the volume being still obtainable from the publishers, and that the relatively short additional period of 15 or 16 years, even with the amalgamation of both volumes of "Pritzel," would not command a large sale; consequently no publisher would be likely to take the risk upon himself. The prospect therefore was that, after many

months or even years of labour, my time would prove to have been misspent and lost. I thereupon abandoned the prospect and turned to other work.

But the aspect at the present time compared with the past is greatly changed for the better. During the period of dormancy the scope of horticulture has both widened and deepened, and the lapse of time, now more than half a century since the second volume of PRITZEL'S "Index" was published, makes a new edition imperative. Under the auspices of this great and powerful Society the work now happily begun is assured of success, and I can now hope to see and handle the new "Pritzel" in my lifetime. It is a great pleasure to think that a work which attracted me in my early years is now being done, and I am glad in my declining years to be associated, in however small a degree, with the production of a book which must prove of immense and lasting service, both to the botanist and the horticulturist.

THE CARE OF THE SOIL.

By H. [E. P. HODSOLL, F.C.S., M.S.E.A.C.

[Read November 19, 1918; Mr. A. C. BARTLETT in the Chair.]

THE title of this article may seem strange to some, who will perhaps regard the use of the word "care" as misplaced in this relation. Surely, they will say, the soil can take care of itself. It has done so, for how many years? probably few of us would like to hazard a guess. It has been subject to great heat and intense cold, has suffered vast upheavals and convulsions and all sorts of marvellous changes, and yet in most parts of the world produces vegetation and crops of some sort or other, with or without human assistance.

This is all true in a sense, and yet the title is chosen advisedly, and we will endeavour to show that from the agricultural and horticultural point of view the word is not misused.

The reason for the choice of this title is that in journeying about the country one cannot but be struck by the lack of care, in the true meaning of the word, that the soil receives at the hands of some of its cultivators. So many regard it merely as a medium in which their crops grow. They cultivate to a greater or less extent to get a tilth in which to place the seed or young plants, or to produce conditions that they know by experience will benefit their crop. They manure it for the same reason, always with their eye on the crop and with little or no consideration for the soil.

This is all perfectly right as far as it goes—the crop is of course the ultimate object of all cultivation, and we have nothing to say against every consideration being given it; on the contrary, it is hoped in the near future to contribute a companion article to this on the "Care of the Plant." But the point it is desired to bring home is that the soil also requires attention—care—for its own sake; in fact, it should be the cultivator's first consideration.

The following is an instance of the lack of appreciation shown by many growers of the importance and value of the soil they are cultivating. Not long ago a sample of soil was received from a big grower for analysis, with an accompanying letter saying: "I am sending you some of the 'dirt' from my farm. I cannot get a decent crop on it, and I do not know what is the matter with it. Please analyse it and tell me what I am to do." One was struck at the time by the words used by this man in referring to "Mother Earth"—the soil he was cultivating—the raw material of his industry—and immediately suspected that this grower would not understand the phrase "the care of the soil."

HALL opens his well-known work on the soil with these words: "The

whole business of agriculture is founded upon the soil," and we have many times referred to it as the growers' raw material. All wealth proceeds from the soil, for it we pay rent or its equivalent, in it the plant grows, and from it (with or without the aid of manures) the plant draws its nourishment, or at all events that part of it with which we are concerned.

It is undoubtedly true that on capacity and skill in managing the soil depend to a large extent the quality and quantity of the crop. Surely then the soil is a thing to study—to watch, understand, and treat with all the available aid of practice and science.

Everybody knows that soils differ widely: the difference in rents paid is an acknowledgment of the fact. It is impossible to obtain either the weight or quality from some soils that may be confidently expected from others. The soil may be heavy or light, and there are innumerable variations between these two extremes. It is obvious that these soils require different treatment in cultivation and management, in manuring and in cropping. In order properly to manage the soil these differences must be studied, and reasons ascertained for any inferiority in order that defects may be, if possible, remedied.

The study of the soil, and the part it plays in the nutrition of the plant, falls naturally under three headings—the mechanical or physical, the chemical, and the biological aspect. Each of these headings could easily form the text for a separate paper, but it is only intended to glance at them in order to point the necessity for the care of the soil advocated, and to suggest the manner in which it may best be undertaken.

MECHANICAL

Origin of Soils.—In order to understand the soil mechanically it is necessary to know something of its origin. As is well known, soils are formed by the disintegration of the rocks that compose the earth's surface. These rocks have been deposited under widely varying conditions and by many different agencies: great heat, extreme cold, violent convulsions, the action of glaciers, the submerging of the land under water, and all the many changes, climatic and otherwise, that the earth has undergone, have played their part.

The study of these phenomena and the classification of the various rocks according to the manner and period of their formation belong to the science of Geology, and it is not intended here to write a treatise on this fascinating science. It is sufficient for our purpose at the moment to remember the facts above referred to, as they explain the great variation of soils, both mechanical and chemical, which is the first point to which it is desired to draw attention. Except in the cases of soils of transportation—that is, soils that have been carried from above the rocks from which they were originally formed, *e.g.* "alluvial" soils—it stands to reason that the soil overlying a certain formation will bear a definite relation to the rock from which it derives its origin.

From the mechanical point of view this variation shows itself in the innumerable physical differences which we encounter in soils, from the very heavy clays to the lightest sands. These differences are entirely due to the varying size of the particles which go to make up the soil. A sand is made up almost entirely of large particles and a clay of small ones, some of them so small that they cannot be measured—so small that they run together to form gelatinous substances known as “colloids.” Between these two extremes we have the various grades of loams, marls, alluvial soils, &c., which are mixtures of sand and clay. The intelligent care of the soil that is here advocated is conditioned in the first place by the class to which it belongs mechanically—that is, whether the particular soil we are treating is a heavy clay, a light sand, or one of the loams or “alluvial” soils that fall between these two extremes. Fortunately many of our garden and intensively cultivated soils are mixed soils, which every practical horticulturist knows are the easiest to manage; but many of our most productive soils are clays, and many of our valuable early soils are sands, and the management of these, while not so easy, is often most profitable when done with success.

Let us first glance at the essential points in the management of a heavy clay soil. We have seen that the “heaviness” of such soils is due to the fact that they contain a large proportion of very fine particles, and that these particles are so fine as to form, when run together, a gelatinous substance that gives them what is known as their “colloidal” or adhesive properties. It is these “colloids,” which the potter spreads evenly throughout the bulk of his clay in the process of working it, that enable him to mould it to his will, and that enable the brick-maker to mould his bricks. The same thing happens when we get our horses on to a heavy soil while it is still wet, or when we turn up a wet furrow with too “slick” a side, or dig such a soil with a spade when it is wet. In all these operations we “puddle” the clay, we separate and distribute the “colloids” and spread them either throughout the mass, in the case of the potter and the bricks, or over a particular surface in the case of the furrow and the “spit” of earth that we turn over. It will be seen that when we separate and spread the “colloids” we get just the effect that as cultivators of such soils we do not want. It follows therefore that what we have to do is the opposite—that is, to segregate or collect them and so mitigate their effect on the soil instead of aggravating it. This then is the first consideration in managing a clay soil. How is it to be done? It is obvious that the aim of our management must be to unite these small particles and so lighten the soil by coarsening its texture.

The first point, as we have seen, is never to work it when it is wet. Directly we see the “puddling” effect described, we should stop the operation whatever it may be, remembering that by going on we are only giving ourselves extra work to undo the trouble later—an opportunity we may not get, in which case we may be faced with “cloddy” soil throughout the summer.

Having briefly enumerated the unkindly features of this class of soil, and what we must avoid doing in order not to aggravate them, we will now pass on to consider the treatment to be adopted to improve or correct them.

Drainage.—The first and fundamental condition of improvement is good drainage. We all know that if a heavy soil is badly drained it is almost impossible to work it properly. Water “puddles” the clay—the fine particles are obviously easily separated and carried by water and evenly distributed over the mass of the soil. In such a soil drainage is the first consideration. A badly drained soil is always wet and unkind in the winter, sets in clods, cracks, and is the first to suffer from drought in the summer. It is impossible in the scope of this paper to deal with this important question of drainage, but all who have reason to suspect that their soil is “water-logged” are advised to have inspection-pits dug about 3 feet deep wherever water is suspected, and to watch whether the water stands in them and does not freely get away. If drainage is necessary, pipe drains are the best, but box, bush, or stone drains are better than nothing and are easily made in a garden. In bigger areas, and especially wet pastures, great benefit may be obtained by the use of the “Mole draining-plough.” Let your main drain deliver to the lowest point in the field or garden, and remember not to run your minor drains down the slope but across it. This is a most important point. If you drain down the slope you merely drain the soil just over-lying the drain, but if you drain across the slope you catch the water between the drains.

Liming.—The next point is liming. The action of lime on heavy soils is fully explained in the article dealing with this subject published in the JOURNAL of the Society (vol. xlii.). It is sufficient for us to remember here that lime flocculates the “colloids” in a heavy soil, that it collects them together and prevents their distribution throughout the bulk of the soil, which, as we have seen, is our primary object. It is therefore obvious that in the care and management of a heavy soil liming must be resorted to from time to time.

Manuring.—The next consideration is the manuring of such a soil. In a paper headed “The Respective Values of Organic and Inorganic Manures,” published in the JOURNAL (vol. xli. p. 217), the mechanical effect of organic manures on various soils is dealt with, and it is pointed out that dung, shoddy, wool waste, and other bulky manures, open out a clay soil and let in the air, and are consequently of great benefit. It is also seen that humus flocculates the “colloids” and greatly improves the working of heavy soils, and that therefore organic manures should be used. An excellent instance of this effect of humus on clay soils may be seen in a ploughed-up pasture where even on the heaviest clays the soil is softer to the tread and breaks down more easily than is the case on the neighbouring arable field. Some mineral manures, such as superphosphate and sulphate of ammonia, owing to their acid residues, have a bad mechanical effect

and should be sparingly used on clay soils. Nitrate of soda also produces a similar result owing to the chemical action of its residue soda, which deflocculates the clay. Salt acts in the same way for the same reason and should not be used on heavy soils. Soot has its greatest effect on cold heavy soils and will be found very useful. So much for the treatment necessary to improve the mechanical condition of heavy soils.

Let us now consider the other extremity—the light sandy soil. We have seen that the sandy nature of a soil is due to the large size of its particles. Such soils are therefore liable to be too much like a sieve in that they let the moisture through them too quickly and with it the food materials that are dissolved in it. Our object, therefore, will be to bind them together and make them more like a sponge that will hold the moisture and less like a sieve. Light soils are generally deficient in humus, and owing to free aeration and great bacterial activity any humus added soon disappears. We must therefore, in dealing with these soils, remember that humus must be added, but bulky manures must be used carefully, otherwise they are apt to open these soils too much and make them hollow. When this mistake is made light soils dry out extraordinarily quickly. It must be remembered that a sand is largely dependent on sub-soil water for its moisture, and therefore nothing must be done to upset the capillary attraction by which the water passes from below to the root area near the top of the soil.

It is generally claimed that lime acts as a binding agent in light soils in the same way as it does in mortar. Light soils are frequently deficient in lime, and the point should therefore not be overlooked.

With regard to manuring such soils, as we have already seen, humus is very necessary, but on the other hand nitrate of soda may be used without harmful mechanical effect, and acid minerals may also be resorted to when necessary, provided of course that sufficient lime is present.

The intermediate soils are easier to manage. The considerations referred to above will come into play more or less according to whether a soil is on the heavy or light side. It may be noted that the management of all soils is largely directed towards the obtaining of the best water supply. In a clay soil we require to let the water through: in a sandy soil we require to hold it. In this connexion it is interesting to note the "colloidal" property of water. Water, as is well known, has to a certain extent an adhesive elastic nature. This is seen in the capillary attraction referred to above, on which we rely when rolling a soil in order to attract the moisture from below. The hoeing of a soil in dry weather has for its object the conserving of the moisture below the top few inches by severing the capillary tubes in the soil, and keeping a "mulch" of dry soil on the top. This is quite a different thing from the ordinary mulching resorted to in green-houses and in the garden generally, the object of which of course is to place a spongy layer on the top of the soil to hold the moisture.

CHEMICAL.

It is obvious that soils differ chemically just as we have seen them differ mechanically; in fact, far bigger variations occur. This is easily understood when the chemical constituents of a soil, as shown by chemical analysis, are examined. A moment's reflection on the widely differing origin and composition of soils will show us that this difference will be evident in their chemical constituents. The only way to ascertain this difference and to learn the percentage of the various essential ingredients in a soil is by soil analysis. Chemically, soils consist of humus and minerals: from the former is obtained the essential plant food—nitrogen—and among the latter are the essential mineral plant foods of which the chief are phosphoric acid, potash, and lime. There are others that are known as the minor essentials, but for all practical purposes we need only examine a soil chemically for its organic matter, or humus, and the nitrogen therein contained, and the mineral ingredients above referred to. The value of a soil analysis as showing the percentage of plant food a given soil contains, and its bearing on the manurial treatment of that soil, is far too big a subject to be dealt with here. The problem is not so simple as it appears, and it is certainly safe to say that a soil analysis requires very careful interpretation by a skilled agricultural chemist. This subject is touched on in "Some Hints on Manuring of Garden and Other Crops" above referred to. It is sufficient for our purposes to know the possibilities of a soil analysis as an aid to the care of the soil, and especially with regard to the estimation of lime, which we have seen plays so important a part in the correct management of all soils. Again, soils differ very considerably in the freedom with which they give up the chemical food materials they contain, and a plant can more easily obtain this food on a sandy soil than in a close-textured clay. Light soils will frequently grow heavy crops with far less food material, as shown by analysis, than heavy soils supporting poorer crops. This is a question of root activity and ease with which water percolates in a light soil. Further, crops differ in the food material taken and required, as is fully explained in the article last above referred to. All these questions are the province of the agricultural chemist; and a most interesting study is open here for the agricultural student. It is sufficient for our purposes at present to glance at this study to show that, to know a soil, the fullest chemical information regarding it should be obtained.

BIOLOGICAL.

Not very long ago the soil was held to be an inert mass containing the food materials of the plant referred to above. It is only recently that we have learned of the biological side. We now know that the soil is peopled by countless millions of bacteria, that these bacteria may be roughly divided into two classes—the beneficial and the

harmful. They form what may be termed the "life" of the soil, and they work for our good or our ill, largely according to how we treat the soil. This work is not carried on promiscuously but is wonderfully organized. Certain groups of bacteria do certain work, which is then taken up and carried on by another group, as it is in a perfectly-organized factory. We are largely indebted to RUSSELL and HUTCHINSON of Rothamsted for our knowledge of the work of these minute organisms. Students of this subject are strongly recommended to read "The Masters Memorial Lectures," given by Dr. RUSSELL, and published in the JOURNAL of the Society (vol. xli. pp. 173-188). It will be seen from those lectures that without the aid of these bacteria the dung and organic manures we apply to the soil are useless; in fact, all the rest of our care is useless unless the soil is made suitable for bacteria. It will be learned that the essentials for their life are moisture, air, lime, organic matter, and certain minerals, such as phosphates, all of which, it is interesting to note, are essential, as we have seen, in the care of the soil for other reasons.

The soil therefore is a wonderful and complex thing, far more than an anchor for the roots of trees. Its very origin sounds almost like a fairy tale. It is full of mechanical problems and forces; a complex chemical study, for every known chemical is found in it; a storehouse of plant food; the home of innumerable minute organisms working unceasingly for us, playing their part unseen, and for centuries unknown, in the great scheme of things, the great plan of Nature. Here is the answer to the problem of perpetual motion, and here may be found, in one form at least, perpetual life. Many things are yet to be discovered, yet to be learned, but do we not already know enough to fill us with wonder and awe and reverence for great Mother Earth, who gives all the minerals for our industries, the food for the plants, and through them for our beasts and ourselves, and receives us altogether—the plants, the beasts, and ourselves—when our appointed course is run? Is it a thing to be treated as "dirt," to be uncared for, unstudied? Is it necessary to plead further for the "care" advocated?—the study, the patience, the storing up of each valuable bit of knowledge until gradually one begins to understand and to know the soil one is cultivating? This is what is meant by "the care of the soil."

FREESIAS AND LACHENALIAS.

By Rev. J. JACOB.

[Read April 8, 1919; Mr. E. A. BOWLES, M.A., V.M.H., in the Chair.]

THERE is much more in common between these two families of plants than one might at first suppose.

Freesias and Lachenalias are both bulbous plants. They come from the same part of the globe—the Cape of Good Hope, or South Africa. They have both of them just missed being hardy in the British Isles, and need the friendly protection of a cool glasshouse in which to grow. The general outline of their cultivation is the same, viz. early potting, a cool temperature during their period of growth, a gradual ripening off, and then a period of thorough rest during which they must be kept dust-dry and warm. They both flower in the early months of the year. Lastly, they are both new-comers to our greenhouse flora, or, to be more accurate, they are reintroductions, for although members of both families were carried captive to Europe over a hundred years ago—as we may learn from consulting such picture-books of plants as the famous REDOUTÉ'S "Les Liliacées," published from 1802 to 1816; and LEOPOLD TRATTINICK'S "Archiv der Gewächskunde," published 1812–1818—for some reason or another they pined away and died, or, what amounts to the same thing in a practical horticultural sense, they disappeared from ordinary gardens, although here and there they continued to exist. The last point in their resemblance is the fact that they are both out to win their spurs of popularity as indispensable plants for the ornamentation of our glass-houses in the early months of the year; for although certain members of each family may be said to have done so already, as *refracta* among the Freesias and *Nelsonii* among the Lachenalias, it is certain that neither the one nor the other may make a similar boast, seeing the possibilities ahead, to Louis XIV. of France, who exclaimed "L'état, c'est moi!" The time is past when anything of the sort might have had some semblance of truth. It is a case of new men, new manners; or, if put horticulturally, new hybridizers, new seedling raisers, new blood; new varieties of divers shapes and colours, which cannot help arousing a widespread interest in both families. The main purpose of this paper is to introduce to public notice some of these novelties, in the hope that their enumeration and description may gain for them a wider cultivation and popularity than is the case at present. There are signs that Freesias are going to forge ahead, especially now that the new coloured varieties are becoming more widely known. Lachenalias up to the present have not made

such a promising start, but the time is bound to come when their quiet beauty and Marathon-like lasting powers will be appreciated by the flower-loving public.

FREESIAS.

South Africa is the home of the Freesia. Thence they have come at different times, beginning probably in the first decade of the nineteenth century with *refracta* and ending in 1898, when *Armstrongii* was brought over by the man who found it at Humansdorp and a single bulb given to Kew. It is the advent of this last arrival that has made possible the wonderful developments that are now taking place. Mr. WILLIAM WATSON, into whose hands the bulb was given, and who was the first to flower the variety in England, describes its colour as a rich rosy pink, and so I can only suppose that a writer in the *Gardeners' Magazine* was wrong when in describing the self-same plant he labels it "purplish."

Taking my cue from the ancient habit of giving to plants popular names suggested by some marked characteristic or some fabled or real use, such as 'Bear's Ears,' 'Eye-bright,' and 'Betty-go-to-bed-at-noon,' in the case of the Freesia I hazard the suggestion of 'Wait-and-see' flower as an appropriate nickname for this tantalizing plant. The why and the wherefore of this will be made clear later on. We must first of all consider very shortly its nomenclature and its history.

The Freesia, in the various names by which it has been known in Europe, calls to our mind the words and the moral of an old nursery rhyme :

Elizabeth, Elspeth, Betsy, and Bess—
They all went together to seek a bird's nest.
They found a bird's nest with five eggs in :
They all took one and left four in.

First the Freesia was 'Gladiolus.' As *Gladiolus refractus* and *G. xanthospilus* it is figured in REDOUTÉ'S "Les Liliacées." Then it became 'Tritonia,' and as *Tritonia refracta* it appeared as the subject of plate No. 135 of the *Botanical Register*, on August 1, 1816. Finally, in the *Botanical Cabinet* of 1830, it assumes its present name of Freesia, and a picture is given of *Freesia odorata*, which was cultivated, the note says, outside in a frost-proof border. In "Linnæa" (1865-1866) F. W. KLATT, as it were, clenched this last name, and so it will remain until some enterprising botanist finds out something fresh about it and suggests another. Hence, as "Elizabeth, Elspeth, Betsy, and Bess" were one in the nursery rhyme, so are Gladiolus, Tritonia, and Freesia in the case of our plant.

The next question to be asked is, How many species are there ? In different books we find descriptions or references to *refracta*, *refracta alba*, *xanthospila*, *aurea*, *odorata*, *Leichtlinii*, *Leichtlinii major*, and *Armstrongii*. If we consult NICHOLSON, BAILEY, and garden papers like *The Garden* and *Gardeners' Chronicle*, we become at once aware that there has existed considerable diversity of opinion as to which

of these plants is which, and also as to which are of specific rank and which are not. Mr. JOHN HOOG, of Haarlem, who has paid great attention to the family, thinks there are three—*refracta*, *aurea*, and *Armstrongii*. Mr. W. WATSON, of Kew, thinks there is only one, and in a letter to the author of these notes writes: "BAKER says that there is only one species, and I see no reason to disagree with him." Now, as Mr. BAKER has made the tribe to which the *Freesia* belongs in a special way his own, and as Mr. WATSON is the curator of Kew, and has every opportunity of studying plants from living specimens, the joint imprimatur of these two men may be taken as "the last word." *Freesia refracta* is the one and only species: *aurea*, *Leichtlinii*, and *Armstrongii* are but Elspeths, Betsys, and Besses, or in other words "forms" of Elizabeth or *refracta*.

The Old Varieties.—What, then, is there to be said about these old originals, as they may well be called in contradistinction to the new seedlings which modern seedling-raisers are producing in ever-increasing numbers? If we compare the old *refracta*, which was cultivated about 1816, with the new seedlings we shall see the difference and variety of forms which have been produced in recent years. Some are like a "throw back," they are so similar in shape to the picture in the *Botanical Register* of the plant that LEE and KENNEDY grew in their nursery in 1816. Some of the others, more particularly the bloom which is named 'Daddy-long-legs,' show how great is the change that has taken place, and are a foretaste of what is about to come. *Refracta*, as it is now known, is a pure white with a yellow blotch on the lower centre segment, and sometimes in addition on the edges of those next it. 'Iscoyd White' is a fine form of this variety, and originated as a chance seedling in the gardens of Iscoyd Park, Flintshire. *Refracta alba* is a pure white variety, of which the American-raised form 'Purity' is probably the best. *Leichtlinii* is a beautiful pale yellow with an orange-yellow blotch. It was introduced into commerce by MAX LEICHTLIN, of Baden, who got it from the Botanical Garden at Genoa. A finer form, called *Leichtlinii major*, has been raised by C. SMITH, of Guernsey. *Aurea* is a small deep yellow, and was introduced by Messrs. WALLACE, of Colchester. Mr. HERBERT CHAPMAN used this variety in the production of his *F. × Chapmanii*, which, like all those just mentioned, is sweet-scented. *Armstrongii* is a "rich rosy pink" variety found by Mr. ARMSTRONG, a land agent, in the course of his professional travels at Humansdorp. He visited Kew in 1898, when he gave Mr. WATSON a bulb. This took good ways and thrived and increased, and in the course of time the hybrid *F. × kewensis* was raised from it. An account of this novelty, from the pen of Mr. WATSON, appeared in *The Garden* for 1901, p. 374. The back volumes of this paper contain numerous articles and references on the history and cultivation of both the *Freesia* and the *Lachenalia*, and should be consulted by anyone who takes an interest in their past.

Seedling Raisers.—The advent of first *aurea* and then *Armstrongii* has revolutionized the Freesia. Hybridists are now busy in producing new varieties, and as a result we have both colours and shapes of bloom that could never have been thought possible before their introduction. Mr. HERBERT CHAPMAN, of Rye, Messrs. C. SMITH & SON, of Guernsey, Mr. JOHN HOOG, of the firm of TUBERGEN of Haarlem, myself at Whitewell Rectory, near Whitchurch, Salop, and Mr. G. H. DALRYMPLE, of Bartley, Hampshire, are names which must be remembered in this connexion. During the early months of 1919 I received four, and Mr. Dalrymple three, Awards of Merit from the Royal Horticultural Society—that is to say, seven awards to new varieties were given in one year, which is a record, and is up to the present the high-water mark of British achievement.

New Varieties.—Appended to this paper there is a list of the awards which have been given to new seedling hybrids or varieties by the Dutch Bulb Growers' Society at Haarlem and our own Society in London. Some yellow seedling forms and a couple of very distinct small-flowered types of bloom, which ladies would very likely call "little ducks," will probably be found to be very useful for small four- and five-inch pots. One yellow variety, which is called 'Yellow Dwarf,' is very similar to *aurea*, which is still cultivated at Glasnevin (Dublin) by Sir F. W. MOORE, who sent me specimen blooms for comparison in the spring of 1919. 'Rose Beauty' received an Award of Merit, and its deep shade of "old rose" marks a distinct advance in deep-toned colour development. Unfortunately it has little or no perfume, but on the other hand it is exceptionally beautiful under artificial light, and when it becomes plentiful is one of those which will be valued for dinner-table decoration. 'Daddy-long-legs' also received an award. It is a tall loosely-growing variety, with large, very sweet-scented open blooms, with rather narrow segments of a rich purple colour with a conspicuous and effective big orange blotch on the lower part of the flower. 'Red Indian' shows a wonderful coppery-red development which, like the last, shows to advantage under artificial light. 'Lavender Queen' is a little like 'Merry Widow,' which received an award and which, by the way, is very sweet-scented. 'Orange Tip' is very similar to Tubergen's 'Contrast.' These white varieties, with very conspicuous deep orange or yellow blotches, will, with new ones added to them, form a delightful and popular series, which will be found to be most effective in a greenhouse. 'Pink Beauty' is one of the open type of flowers. It is of a lovely pale pink colour and very distinct. It is well to compare this with 'Daddy-long-legs,' since these spread-out blooms are a great break-away from the older, and what has hitherto been considered to be the normal, type of Freesia. 'Pinkie' is included because its colour is unusual—it is a clear, clean pink without any suggestion of blue. 'Blush Beauty' is very sweet indeed—a plant of tall and vigorous growth. It suggests possibilities of scent and growth, which may

become common as development or change proceeds. These new varieties give a very good idea of what we now have in the way of shape and colour. It will be noticed that there are no named yellow flowers except the small 'Yellow Dwarf.' The reason is that there did not appear to be such an opening for flowers of this colour as for others, seeing that Mr. CHAPMAN has given us *Chapmanii* and last year (1918) *Chapmanii aurantiaca*, and Mr. JOHN HOOG (Tubergen) 'Canary,' 'Buttercup,' and 'Apogee.' 'Canary' is, all things considered, the pick of the bunch, but it has not the deep, rich yellow tone of *C. aurantiaca* or of 'Apogee.'

Freesia Peculiarities.—It is from these peculiarities that the name 'Wait-and-see' flower has been suggested as appropriate:—
(1) The waywardness of the yellow spots in pure white flowers. To get a thicker and wider-petalled form than the 'American Purity' would be something worth having. Several times I have said to myself, "Hurrah! at last I have one!" only to have my high hopes dashed to the ground or blown sky-high (whichever phrase best expresses shattered expectation) when, after "one little, two little" flowers have opened of the purest white, the "third little" has developed the unfortunate mark. It has been suggested that the botanical explanation is that the latest fashion in shapes has caused the poor petals to get a little mixed up, and that they had to wait and see in these new developments which was top and which was bottom petal—hence their delay and uncertainty.

(2) The "breaking" or, were it tulips that are under consideration, their "rectification." Not that this word is at all appropriate according to modern ideas—the half-swear word "damnation" would be much more so, for, alas! most varieties suffer considerably from the change. *Freesia* 'Whitewell' shows the effect of the change when it is anything but flattering. In 'Chameleon,' where the colour varies very greatly with age, the effect is pleasing, but this may not be quite the same thing. We cannot discuss the question here.

(3) "Duds." Every grower of the new varieties has had the experience of good, sound, plump corms refusing to appear above ground after they have been potted in the most approved way in August or early September. Why is this? Different explanations have been offered. They may be "weary Willies"—that is that they have done so much one year that they must take it easy the next; or they may be "guzzling Georges"—they have not had all the food they require, and they want to have a good tuck-in before they start work again, only what they do eat in their retirement is a mystery; or, thirdly, and most probably, they are "chilled Charlies"—the poor beggars have caught a "cough" when they were being ripened off, or it may be after they have been potted, for to start these new varieties in a satisfactory manner they seem to require an atmosphere rather warmer than that of a cold frame. The evidence of growers distinctly points to a chill at some period

of the bulb's cycle of life being the determining cause—hence the necessity of a thorough ripening in a warm, sunny, perfectly dry place, and a genial atmosphere, say one of 50°, at nights when the bulbs are starting a new year's growth in August and September. One thing seems pretty certain, the old *refracta*, *refracta alba*, and *Leichlinii* are less liable to produce "duds" than the newer additions to the family. It seems that the *Freesia* is not the only South African bulb that displays this aggravating habit—*Lachenalia aurea* is a great sinner in this respect. Hence, with regard to *Freessias*, you can pot the bulbs, but you have to "wait and see" what will happen. You know the old proverb about taking the horse to the water, but not being able to make him drink. One could invent a saying on all fours with it about *Freessias*—something like this: "You can pot a *Freesia*, but you can't make it grow."

Cultivation.—The year begins in mid-August. St. Grouse's Day (the 12th) is an ideal date on which to begin to pot the bulbs. All bulbs should be got in then or as soon after this date as possible, whether the flowers are wanted early or late. The difference had better be made by leaving some a longer time than others in the cold but perfectly frost-proof frame before bringing them into a very gentle heat. In this way I have had *Freessias* in bloom from January until April—a fairly long season, but one which might be extended by potting in July and bringing them on rather quicker than the others. Flowers may then be had at Christmas. Any good light porous soil which has been enriched by good old farmyard manure in the proportion of 1 to 4, and to which a good quantity of coarse sharp sand to keep the mixture open has been added, will be quite suitable. When growth is starting a *slight* heat is beneficial in case of the newer-coloured varieties at the start, but with regard to the older *refracta*, *refracta alba*, and *Leichlinii* ones it does not seem to matter. Very little water is necessary until the flower spikes begin to shoot up, and the pots are in a genial greenhouse temperature. They require a good deal then; and at least once a week a drink of an artificial of some kind like "Clay's" is very beneficial. This feeding should be continued until the leaves have partly turned brown, when all water must be withheld and the pots stored in a sunny, dry place until the bulbs are shaken out and graded.

During December, January, and February a night temperature of from 45° to 50° Fahr. should be aimed at. Staking should be done in good time, so as to keep the stems upright and straight.

Raising New Varieties.—It is necessary, particularly until the end of February, to hand-fertilize all flowers from which seed is wanted. It is best to sow it in August, in six- or seven-inch pots, each seed being half an inch apart from its nearest neighbours. The pots should be placed in gentle heat from the start, and the young seedlings which will appear in a few weeks' time should be carefully grown on in a rather warmer temperature than that which suits the

older plants. Plenty of air is essential for all Freesias, and seedlings are no exception to the rule. A small number will flower in March, April, and May—that is, in from seven to nine months from the date of sowing. The general treatment to be followed is much the same as that for older bulbs. From the beginning of March until the yellowing of the leaves tells us that the little bulbs are wanting their period of rest, some mild stimulant should be given once a week in a liquid form. Then, when August comes round, the pots should very carefully be emptied of their contents so that the mother-bulbs and any little off-sets that may have been formed are not separated, but are kept together ready to put in the 3½-inch pots, in which they are to spend their second cycle of growth.

LACHENALIAS.

Lachenalias when they first came to Europe must have attracted attention in horticultural circles, otherwise the series of pictures in TRATTINICK'S "Archiv" and elsewhere would never have appeared. As this is not a botanical treatise there is no need to enumerate the various species or to group them scientifically. It is sufficient to speak of those which, together with a goodly number of seminal varieties, are to be found as cultivated plants at the present time. Why their number is not greater, and why man has not taken them in hand as he has done in the case of other families of bulbous plants, is not easily explained. They are quiet, unassuming creatures, which do not by stature, scent, or colour "stir it and stump it and blow their own trumpet," and so under modern conditions of success are out of it. Their whole being seems to be out of harmony with our bustling, strenuous life, and so they have never become fashionable and their devotees have been "few and far between."

Between 1770 and 1830 was, roughly speaking, the first era of Lachenalias in Europe, although MILLER, in his "Dictionary" in 1752, refers to *L. orchioides* as an old inhabitant of our greenhouses. In the second edition of the "Hortus Kewensis" in 1811 eleven varieties are enumerated, and in 1836 thirty-six in SWFET'S "Hortus Britannicus." Of these last two or three may be no longer Lachenalias but the number is sufficient to show that some interest was then taken in their cultivation.

The next era may be taken to have started about 1870. *The Garden* newspaper did much to encourage the growing of these bulbs by references and articles from the pens of Mr. F. W. BURBIDGE, the Rev. J. G. NELSON, Rector of Aldborough, Mr. W. B. HEMSLEY, and others, but all to little purpose. Mr. NELSON raised seedlings of which *L. Nelsonii*, first exhibited in 1881, is a lasting memorial of his work. A brother clergyman, Mr. MARSH, Rector of Cawston, did the same. Then Sir F. W. MOORE, of Glasnevin, tried his hand and gave us some beautiful varieties. He also contributed a most instructive paper to the R.H.S. JOURNAL (vol. xiii. [1891]).

Last of all I have given much attention to them myself, and but for the War more of my work would have been seen at Vincent Square. 'Rosemary,' which is one of the few that have appeared, has received an Award of Merit. The varieties may be grouped as those which have a red edge to their bells and those which have not. 'Greenland' has a more or less greenish look; and 'Burmah' has a more yellow look, and a very pronounced red top to its spike of flowers. 'Pekin' is a glorious yellow. 'Ostend,' 'Dublin,' and 'Lyons' show various forms and colours of edged flowers. Thus it will be seen that greater diversity of colour is slowly being evolved in the different members of the family. *L. glaucina* is one of the sweet-scented species which are still to be had from dealers. Its general appearance—no stalks to the bells, which are hardly coloured at all—is similar to that of *orchioides* and also *pallida*, which are likewise sweet-scented. Their perfume is like that of Lily-of-the-valley or yellow Genista. They are worth growing for this reason alone. Unfortunately they do not seem to cross with tricolor and quadricolor varieties, for if only scent could be introduced into such kinds as *Nelsonii* and 'Rosemary,' the public verdict on the race would be quickly changed. Besides the species already named, *L. racemosa* (white) and *L. pendula* are also to be found in our gardens. This last one is most distinct, being a pleasing shade of a bright brick-red, and is quite unlike any of the tricolor or quadricolor hybrids; moreover, as it blooms about Christmas when potted in August, it is a variety that should not be omitted by anyone who grows a collection of these useful Cape bulbs.

Cultivation.—What is sauce for the goose is sauce for the gander. The general principles which should guide us in the management of Lachenalias are the same as those which have been laid down for Freesias. Early potting in rich, light, porous soil, on or about August 12, cool treatment from start to the finish of their cycle of growth, a thorough ripening-off and rest before replanting again, constitute the main rules for growing them. The great difference is that if the plants are to be strong and sturdy they must never be put in a high temperature—not so high as that which suits the coloured Freesias. From 45° to 50° is what should be aimed at, as one or two degrees lower or four or five higher from time to time will be quite all right. They must have plenty of air, but cold currents of air playing on the leaves are fatal.

To look their best, all varieties of Lachenalias should be planted in shallow pots or round pans, which can now-a-days be bought from any seedsman. Their use makes an enormous difference to the *tout ensemble* of well-grown plants. Some growers use wire baskets lined with moss and with the interior filled with soil into which all round the sides and on the top Lachenalia bulbs are placed. With care in watering, grand, irregular balls of flower and foliage may be had, which are then very useful for suspending in a cool conservatory or in a glass winter garden, where frost is excluded.

Naturally, to get the best results in either pans or wire baskets, the bulbs should be carefully graded before they are planted. It will generally be found that there are a good many small ones hardly as large as a sweet pea. These may be planted in seed-pans and grown on if they are those of varieties which we wish to increase. Six bulbs in a five-inch pan or low pot, eight or nine in a six-inch one, is a rough guide to go by in planting. Larger pans must be filled in proportion. Feeding during the period of growth, and especially when the flowers are past their best, until the time when the foliage begins to turn colour, is necessary, and it is well to remember that they like their "tipple" a little stronger than that which suits *Freesias*.

Seedling-raising.—All who grow *Lachenalias* should raise seedlings. The young plants are so vigorous and strong that it is well worth doing. Hand-fertilization is necessary, for when they are left to themselves but little seed is produced. Seed should be sown in early August, and the pots or pans should be placed in a cool greenhouse and the seedlings kept growing as long as possible the following spring and early summer. After their period of rest the tiny bulbs should be taken out of the soil and replanted—one in a three-inch pot, or very thinly in good-sized pans. A few flowers will appear in the following flowering season, but it will not be until they have passed through another cycle of growth and have once more been potted up—this time in, say, 4-inch pots, keeping all bulbs of each sort together—that they will be seen at their best. In other words, seed sown in August 1919 will produce an odd bloom or two in February and March 1921, but their real flowering for the first time will not be until a year later. In sowing, every seed should be half an inch away from its nearest neighbour.

General Remarks.—Few flowers last longer in perfection than *Lachenalias*. Tulips, hyacinths, and daffodils cannot compete with them in this respect. They are popularly known as 'Cape Cowslips,' but they might be more appropriately called, from their general shape and look, 'Yellow Wood-hyacinths.' I have seen splendid results attained yearly when they have been grown from start to finish in a dwelling-house, without even the help of a cold frame. Common-sense, care, and a knowledge of the plants' requirements have brought this about.

Varieties to grow.—*Glaucina* or *orchioides* (for their delightful scent); 'Rosemary,' 'Cawston Gem,' *Nelsonii*, 'Brightness,' 'Ruth Lane,' 'W. E. Gumbleton,' 'John Geoghegan,' and *luteola maculata*. When they come into commerce, 'Greenland,' 'Holland,' and 'Burmah' should be included.

LIST OF AWARDS MADE BY THE R.H.S.

Freesias certificated in London.

Amethyst (Tubergen), April 16, 1907, A.M.
 Aurea (Wallace), May 28, 1902, A.M.
 Bartley Mauve (Dalrymple), April 8, 1919, A.M.
 Bartley Rose (Dalrymple), April 8, 1919, A.M.

Chapmanii (Chapman), March 5, 1907, A.M.
 Chapmanii aurantia (Chapman), Feb. 12, 1918, A.M.
 Daddy-long-legs (Jacob), March 11, 1919, A.M.
 Excelsior (Sutton), Feb. 24, 1914, A.M.
 Goldfinch (Dalrymple), April 8, 1919, A.M.
 La France (Chapman), Feb. 13, 1917, A.M.
 Lavender Queen (Chapman), Feb. 12, 1918, A.M.
 Le Phare (Tubergen), April 16, 1912, A.M.
 Merry Widow (Jacob), Feb. 25, 1919, A.M.
 Pinkie (Jacob), March 25, 1919, A.M.
 Refracta alba (New Plant Company), July 2, 1878, F.C.
 Rose Beauty (Jacob), Feb. 25, 1919, A.M.
 Rose Queen (Barr), Feb. 23, 1909, A.M.
 Tubergenii (Tubergen), March 6, 1906, A.M.

Coloured Freesias certificated in Haarlem.

Amethyst, soft mauve, Gold Medal, Haarlem, 1905; A.M., London, 1907.
 Tubergeni, carmine rose, white throat, A.M., London, 1906.
 Robinetta, ruby red, yellow throat, the darkest yet raised, A.M., Haarlem, 1912.
 Le Phare, bright rose carmine, A.M., London, 1912.
 Appleblossom, soft rose, exceedingly free flowering, A.M., Haarlem, 1914.
 Bluebeard, violet-blue, 1st Class Cert., Haarlem, 1914.
 Canary, soft yellow, orange spots, A.M., Haarlem, 1914.
 Giant, soft lavender lilac, rose tinge, strong, long stems, A.M., Haarlem, 1914.
 Preciosa, soft blue mauve, white and yellow throat, A.M., Haarlem, 1914.
 Apogee, soft primrose yellow, darker yellow tinged, 1st Class Cert., Haarlem, 1915.
 Buttercup, primrose yellow, orange shaded, large and vigorous, 1st Class Cert., Haarlem, 1915.
 Conquest, bright rose, very large flowers and spikes, A.M., Haarlem, 1915.
 Jubilee, rosy white, outside carmine, A.M., Haarlem, 1915.
 Iris, rosy mauve, A.M., Haarlem, 1915.
 La Frappante, soft blue, white throat, A.M., Haarlem, 1915.
 La Charmante, rosy lilac, A.M., Haarlem, 1915.
 Mouette, milky white, lilac tinge, outside carmine, A.M., Haarlem, 1915.
 My Pet, white, rosy tinged, A.M., Haarlem, 1915.
 Apothéose, lilac rose, extra large flower, 1st Class Cert., Haarlem, 1916.

Lachenalias.

Aldborough Beauty (Barr), March 10, 1885, F.C.
 Brightness (Moore), Feb. 13, 1906, A.M.
 Brilliant (Moore, Bennett-Poë), Feb. 28, 1905, A.M.
 Cawston Gem (Van Tubergen), March 10, 1896, A.M.
 Jean Rogers (Moore, Bennett-Poë), Feb. 28, 1905, A.M.
 Kathleen Paul (Moore), March 6, 1901, A.M.
 May Crosbie (Moore), March 5, 1907, A.M.
 Nelsonii (Nelson), Feb. 8, 1881, F.C.
 Phyllis Paul (Moore), March 26, 1901, A.M.
 Rosemary (Jacob), Feb. 8, 1916, A.M.
 Ruth Lane (Moore), March 10, 1903, A.M.
 Tricolor maculata (Glasnevin), Jan. 15, 1895 (as quadricolor maculata).
 W. E. Gumbleton (Moore), March 11, 1902, A.M.

THE PUBLIC PARKS OF GLASGOW.

By JAMES WHITTON, J.P., V.M.H., Superintendent of Parks
and Curator of Botanic Gardens, Glasgow.

[Read March 11, 1919; Mr. W. A. BILNEY, J.P., in the Chair.]

AMONGST the many problems which urban authorities are called upon to solve, not the least is that of providing "lungs" in the form of parks and open spaces in or near densely-crowded districts. In these districts the pure blue of the sky and the brilliancy of the sunshine are dimmed by smoke and foul vapours, and from their streets the glories of the starry firmament and silver moonlight, or even a blade of grass, are seldom or never seen by the children.

By the provision of such "lungs," and better sanitary surroundings, the tendency to degeneration of the town-born may be checked, and the lives of those who must live under unnatural conditions, and work in warehouses in closely-built, dingy streets, are made more healthy, happy, and pleasant.

The truism that a healthy body tends to make a healthy mind, without which no one can be a good or healthy citizen, cannot be gainsaid. It is due to the appreciation of this that municipal authorities everywhere are striving by the provision of parks, open spaces, and children's playgrounds to undo the evils resulting from the short-sightedness of their predecessors, who too frequently parted with the civic patrimony which ought to have been handed down unimpaired to their children's children, or failed to provide for the outdoor recreative requirements of the rising generations of an expanding city.

Indeed, the demand for football and hockey pitches, cricket fields, tennis courts, bowling greens, &c., in city public parks has become so great that a different view has to be taken in regard to the design and equipment of public parks from that insisted on in days gone by, and experience has shown that the views and ideas of many eminent landscape gardeners of those days have in a sense become obsolete.

In former days parks were in great measure set out for the quiet, restful, reflective spirit of easier-going times, and old ideas have had to be modified or superseded by arrangements probably less artistic but more adapted to meet the necessities of the activities of the present generation.

These changes are shown by a study of the requirements of modern public parks, more especially of those within our own island, where the area set aside for games has to be much greater than it was, say, half a century ago. While that utilitarian feature

is necessary and desirable, the fact must not be overlooked that parks which are provided and maintained from local rates ought to be, as far as possible, arranged to meet the tastes of all classes of the community.

Therefore, if it be hardly possible nowadays to lay out city parks satisfactorily on the old stately lines, there is nothing to hinder municipalities in meeting most of the modern requirements of those who demand quietude and restfulness in their hours of leisure in the open air, by the provision of these features which tend to that end in the shape of quiet nooks amongst noble trees, graceful and elegant shrubs, and hardy plants of all kinds, each possessing some feature, either in habit of growth, shape or colouring of leaf or flower, to attract the attention and interest of the great body of visitors.

If one can arrive at a sound judgment of public taste by close observation, then the tendency is towards a keener and closer examination of the subjects when the variety is greatest. Great masses of colour, though desirable in many respects for bold effects, may appeal to the casual passer-by, but do not create the enthusiasm of, say, a border of roses, sweet peas, carnations, pansies, and similar homely flowers; while a border of old-fashioned herbaceous plants, or even a moderate collection of dwarf and alpine plants, will have hundreds of regular visitors who keenly watch the development of their favourites during the season.

From an educational point of view such features in public parks are of incalculable value; and, while we may not all agree with the methods of nature study as practised by certain types of teachers, there are others to whom the variety of plants grown in public parks and gardens is a godsend by enabling them to find in these some subject to interest even the dullest pupil. Let us show how far Glasgow has met the views and ideas desiderated.

Glasgow, from its earliest period until comparatively recent times, appears to have devoted itself more to the cultivation of its industries and commerce than to the beautifying of its urban and municipal areas.

Historians have recorded that its surroundings were delightfully picturesque, and that the private gardens of its citizens were pleasant and charming. We have ample evidence of the truth of these statements, despite the fact that much of the natural beauty is now a thing of the past. There is also the old joke that Glasgow, "Gude Sanct Mungo's toun sae smeeky," is a place to get out of as quickly as possible. This libel we can laugh at, and though we have more smoke than we desire or care for, its presence is an indication of the vigour and push which have made our city one of the greatest in the Empire. It also indicates an evil which, unchecked, materially injures the health of the community and adds considerably to the difficulties attendant on the subject we are dealing with.

Glasgow, not being a capital city, nor one of Royal residence, possesses no park through Royal favour. London has its Hyde

Park and several others. Edinburgh has its King's Park, and Dublin the famous Phoenix—all of which, being Crown lands, are maintained by the nation.

Glasgow parks, with certain notable exceptions, were all purchased and all are maintained out of the local rates.

Prior to 1852 the only park in the city was The Green, and it is a matter for regret that the Town Council of the twenty-five years preceding that date did not secure two or three places as parks in view of the great increase of the city during that period.

Since 1878, however, the increase in the city in the number of parks and open spaces, whilst somewhat spasmodic and irregular at periods, has during the past quarter of a century been steadily progressing, and now for number and variety they will compare favourably with other cities of the Kingdom, London being excepted for obvious reasons.

While Glasgow has not yet attained to what is my ideal of a public park, viz. an area large enough for provision to be made for most outdoor games such as football, cricket, hockey, tennis, croquet, golf, and bowling; gymnasia, sandpits, &c., for the youngsters; a large lake where boating in summer and skating in winter might be enjoyed by the thousands of city dwellers who are penned up in the day-time in offices, warehouses, or factories; ample space for perambulation, as well as broad, well-kept lawns, with fine trees and shrubs and flowers, to give that feeling of repose and refinement which to thousands is the most health-giving power city parks possess; plenty of suitable rests and shelters for the weak, the weary and aged, along with the many other adjuncts which go to make for the pleasure and comfort of humanity—while my ideal has not yet been attained, considerable progress has been made towards that end.

We may now briefly describe the principal parks of the city, in the order of their acquisition.

GLASGOW GREEN.

Area 136 acres, acquired between 1660 and 1692, the oldest and, until 1852, the only park of the city. Bound up in the affection of native-born citizens, it has not infrequently been termed the "People's Park." Indeed, in very few cities in our country is there a public park whose history is more associated with its civic life than our venerable and beloved Green.

It is identified with the traditions of old Glasgow to a marked degree, and has been the scene of many gatherings, political and otherwise. From the times when the Trongate and Gallowgate, High Street and Saltmarket, along with the Briggate, formed the central part of the city, with the magistrates—of which the picturesque and immortal BAILIE NICOL JARVIE is the accepted type—holding the "plain stanes" with all civic dignity, down to prosaic

modern times, amidst all the toil and moil of a busy, bustling city life, despite its many unnatural drawbacks, it yet proves a healthful resort to the weary toiler whose aims and tastes are towards higher things than those of the hanger-on who lounges at the street corner or prostitutes his manhood by vicious indulgence in strong drink.

For generations it has been the rendezvous of those who desire to ventilate their grievances against all laws human and divine, as well as of those whose aims are for the regeneration of mankind socially, morally, and spiritually. No wonder, then, that it is beloved of the people, and any alteration is jealously watched in case such work would militate against what is regarded as the usefulness of the Green.

Time will not permit, even although it were desirable, to enumerate the many changes which have been wrought on the Green to bring it from what was but a "common" to a park to meet modern requirements. These changes began with the early years of the nineteenth century, when the pulse of the city's life was quickening towards expansion and improvement, in which the Green shared.

KELVINGROVE PARK.

Area 87 acres, acquired 1852-54 and 1881-1904. The rapid expansion westwards of the city, resulting in the covering-up of all the fields with streets of houses and the sweeping away of old landmarks, created feelings of dismay and alarm in the minds of thoughtful citizens, with the result that an agitation to secure one or more of the rapidly disappearing residential estates as an open space for the public resulted in the purchase in 1852 of the mansion and lands of Kelvingrove, at one time the country residence of a former Lord Provost.

This picturesquely situated property, through which flows the River Kelvin, was laid out from designs by Sir JOSEPH PAXTON. As a city "lung" it is ideal, but its steep slopes and lack of large flat spaces for games hardly meet modern requirements where active outdoor sports are in such demand. Like its forerunner, it has charms for the native-born. Most Scotsmen the world over have heard the song, "Let us haste to Kelvingrove, bonnie lassie O!"

Owing to its central position, and being so well served with tramway, subway, and railway facilities, it is an ideal site for International Exhibitions. Three of these, held respectively in 1888, 1901 and 1911, were conspicuously successful. These Exhibitions necessarily caused serious alterations in the original contours of the park, though in the restoration advantage was taken to make various improvements. Amongst these were the erection of the splendid Art Galleries and Museum, which is managed by the Corporation, the building of two handsome stone bridges across the River Kelvin, the formation of four public bowling-greens, and, by cutting off an unnecessary carriage drive, a much larger playground for children.

When acquired, this park was noted for its fine old trees. It is a matter of painful regret to see these gradually dying out, and it is not an easy matter to rejuvenate arboreal vegetation in a place where the conditions of the surroundings militate so severely against plant life. A considerable variety of deciduous trees have been planted in this park, amongst which a large variety of hawthorns may be instanced as an object-lesson in proving the value of that family for planting in smoky towns.

THE QUEEN'S PARK.

The success of the Kelvingrove Park caused the municipal authorities to look southward for a park to meet the requirements of the city which was extending in that direction. It is said that feeling was somewhat keen on such a project, as the park was two miles from the centre of the city and without the city boundaries, and the proposal to purchase was only carried by the casting vote of the Lord Provost. Men's minds, like the city itself, have expanded considerably since 1857, when the eastern half of the estate of Camp-hill was acquired, to form what is now the Queen's Park. This also was laid out from plans by Sir JOSEPH PAXTON. For over thirty years the park was without the city boundaries, but with the passing of the City Extension Act, in 1891, several smaller burghs created by the overflow of the city were then amalgamated within the municipal area along with this outlying park. In 1894 the western half of the estate, with the mansion-house, was purchased and added to Queen's Park, thus including what was the natural and dominating feature of the landscape. In this latter purchase the Old Caledonian or Pictish Camp, from which the estate derives its name—Camp-hill—became the property of the city. When the park was laid out in 1858-60 a large variety of trees and shrubs were planted, and many have now attained fair dimensions. Unfortunately, through some peculiar idea regarding treatment, the central leaders of nearly all the trees were pruned off, with the result that few will ever attain the dignity of fine-boled trees, and the majority will be but glorified bushes. The park retains much of its old-world air, and is considered to be one of the most delightful and most popular places of resort within the city's boundaries.

ALEXANDRA PARK.

In 1869 certain city improvements were being carried out, amongst which was the formation of a park for an expanding district to the east of the city. The area at first was about 79 acres. In 1891 other 40 acres were purchased, but as the formation of a new street and a railway divided up the property, only about twenty acres were added to the park, the balance being conveyed to other Civic Departments. Being in close proximity to iron and chemical works, as well as to a huge extension of the city's gasworks, combined with

the drawback of a poor, cold, clay soil, the situation is anything but ideal for the growth of such vegetation as is desired towards the arboreal furnishing of a public park. Here we had a valuable object-lesson regarding the use of trees and shrubs unsuited for the situation, as the bulk of the earlier planted trees, especially the poplars and willows, did not last quite twenty-five years. The replanting with other species is gradually making good the loss, but it is not easy to make up a leeway of a full generation.

CATHKIN BRAES PARK.

Situated six miles from the city, with an area of 49 acres. This park was given, in 1886, to his native city by the late Mr. JAMES DICK, who made rather strict conditions as to its use and treatment, as he desired it to be kept as nearly as possible in its natural state. His wishes are faithfully adhered to. The situation being high, it commands a magnificent view of the city and lower reaches of the Clyde valley. Yearly it is increasing in favour, and on public holidays is a popular place of resort.

With the passing of the City Extension Act of 1891, a new epoch in the history of the parks system began. Provision had to be made for parks and recreation grounds in the district annexed, apart from any which happened to be within the added areas. One of the most important acquisitions was that of the Gardens belonging to the Royal Botanical Institution of Glasgow, situated in the western district. Of the difficulties and struggles which the old Royal Botanic Society had in maintaining these Gardens we cannot fully enter upon here. Suffice it to say that it takes much enthusiasm, as well as money, to maintain a Botanic Garden which is not subsidized by the State or a municipality. Looking back on the history of these Gardens, one hardly knows which to admire most—the perseverance or the liberality of the promoters. All honour to them in their great work! There is, however, a limit to everything, and the struggle was too one-sided and too severe to last. Fortunately for the city, the Corporation took up the burden, and the citizens may rejoice that they now possess not only a delightful resort, but an institution which plays an important part in the educational forces of the city.

To many strangers the keeping-up of a Botanical Garden by a municipality is somewhat of a surprise, as usually such institutions are owned and entirely maintained by the State, such as those of Kew, Edinburgh, and Dublin, or by a University, as at Oxford and Cambridge. I may say, however, that Liverpool and Belfast Corporations now own and control Botanic Gardens similar to those of Glasgow, and probably at no distant date Birmingham and other cities may follow suit and rescue their Gardens which struggle on under adverse circumstances from the oblivion which threatens them.

RUCHILL PARK.

Significant name!—which, anglicized, means Roughhill. How this place came to be purchased as a public park is somewhat of a mystery. The only trees on its area were a few miserable specimens alongside of what had been the avenue to a mansion, and a few overgrown hedges dividing the fields of a badly cultivated farm, with, on its western side, a variety of industries such as oil, glass, bottle, iron, and chemical works, all emitting smoke and fumes inimical in the highest degree to plant life. The only redeeming features were its proximity to a densely populated area in the northern section of the city and its altitude, from which, under favourable conditions, splendid views northwards are obtained of the hills of Dumbarton, Stirling, and West Perthshire. As there was hardly an acre of level ground in the park, it was somewhat of a puzzle how to adapt it for general park purposes. However, it was tackled, with results which have been fairly successful considering the many disadvantages of the situation. The question of finding out what, in the way of trees and shrubs, in dismal surroundings, bad exposure, and poor clay soil, would exist—not to say thrive—opened a field for experiment; so, along with the reliable hawthorn, everything that had any apparent prospect of living was tried, with, in many cases, surprising and satisfactory results, thus giving a wider and more varied selection of material for planting in similar situations.

SPRINGBURN PARK.

Situated in the north-eastern part of the city, this park has the highest altitude of any within the municipal boundary. From its highest point magnificent views are obtained of the Kilpatrick and Kilsyth hills; while through the valley between these ranges are seen many of the mountains of mid-Perthshire. Not infrequently, when atmospheric conditions are favourable, Goatfell and other Arran hills, as well as those of lower Argyllshire, are seen to the westward. This park, like Ruchill, was anything but well cultivated, doubtless due to the fact that the underlying minerals were more important than what could be raised in the way of agricultural produce from the poor surface soil.

The disposal of the huge heaps of material from the iron-stone pits was one of the problems to be solved, along with others, to adapt the situation for public park purposes. Through time, with dogged perseverance, the difficulties have been overcome and assisted by the generosity of the Messrs. REID, of Hydepark Locomotive Works, who even gave the magnificent Winter Gardens and bandstand, and defrayed the cost of removing the latter to a new position after having been nearly twenty years in a somewhat unsuitable situation. With additional ground for football &c., this park is now one of the best equipped, having bowling-greens, cricket and football pitches,

tennis courts, model yacht pond, also two ornamental ponds for waterfowl and plenty of swings for children.

The growth of trees and shrubs has been satisfactory considering all difficulties, and the transformation of an old sandstone quarry into a wild rock garden has changed the bare exposed place into one of interest and pleasure.

MAXWELL PARK.

This small park, given by Sir JOHN STIRLING MAXWELL of Pollok to the burgh of Pollokshields, also came into the possession of the city in 1891. Though limited in area, it admirably suits the needs of the locality, which is purely a better-class residential one. Fairly well equipped, it has a model yacht pond, courts for lawn-tennis &c., swings for children, and the inevitable bandstand! Most trees and shrubs thrive well, but owing to the peaty nature of the soil—the place was within memory a peat bog—the most noteworthy are the Rhododendrons, which luxuriate better than in any park within the civic area.

POLLOK GROUNDS.

Mention might be made here of those grounds, seeing that the entrance thereto is within a short distance of the aforementioned park. Part of the well-wooded policies of Pollok, to the extent of 121 acres, has been granted for ten years—free of rent—to the Corporation for the use of the public by Sir JOHN STIRLING MAXWELL. In that area there is a grass field of about 20 acres for picnics, games, &c. The paths through the grounds have been extended to admit of the public having more scope to admire the sylvan beauties of the situation. Full advantage is taken of the privilege by the public, and in the spring and early summer months, when the thousands of Rhododendrons, along with the indigenous wild hyacinth or blue-bell, are in bloom, as well as when in autumn the foliage coloration is in its glory, the citizens appear in hundreds to enjoy the scene. The period of ten years expires in 1921, and whether the privilege will be renewed for a further period it is impossible to say, but in all probability it will. Here a slight digression from our subject may be allowed by stating that, in dealing with their lands adjacent to overgrown cities, few have dealt more generously, in regard to space and conditions, to preserve the general amenities of the city than the MAXWELLS of Pollok. Glasgow would have been a brighter and better place to-day had all proprietors dealt as generously with their property.

BELLAHOUSTON PARK.

The acquisition of this park in 1895, the largest within the city boundaries, is an example of looking forward and securing ample space in the southern districts of an ever-growing city, though at

the time of purchase objections were raised that the park would serve certain outlying burghs more than Glasgow. While true to a certain extent, the same spirit which inspired the acquisition of the land now occupied as the Queen's Park inspired the Council in this case, with results somewhat similar.

Queen's Park was in existence for over thirty years before the surrounding burghs were annexed, and, in 1912, the burghs in proximity to Bellahouston were absorbed and now reap all the benefits provided by the larger community. The park is bounded for over a mile by the main road between Glasgow and Paisley, which is probably the busiest highway in Scotland. From the high ground, or hill, which forms the central part and dominates the whole, there are splendid views of the surrounding country. To the north-east and east, the towers, spires, and tall chimneys of the city stand out prominently amidst the great mass of grey masonry. Due north, the great shipyards of Govan and Partick are much in evidence, as also the many industrial works associated therewith, and great ranges of tenements on the rising ground behind, while beyond are the Dumbartonshire and Stirlingshire hills. To the west the view is extended down the valley of the Clyde to Clydebank, Dalmuir, and Dumbarton on the north side of the river, and on the south bank to the old town of Renfrew. To the south-west is the town of Paisley, then further due south are the Gleniffer and Fereneze Braes, the town of Barrhead, with a range of hills and the outstanding "Neilston Pad"; then following are the high lands of the Mearns and Cathkin towards the south-east of the city, thus completing the circle—wider and more varied scenery than is possessed by most parks in this or any other city.

Provision is made in the park for bowling, football, hockey, cricket, golf, &c., and a large 15 to 20-acre lake is contemplated.

TOLLCROSS PARK.

To secure a suitable park in the eastern district of the city was a matter of some difficulty. Fortunately, through the efforts of a worthy citizen, the mansion and policies of Tollcross were purchased at a reasonable price in 1897. This purchase saved one of the last of the beauty spots left in the immediate vicinity of that part of the city, where huge iron and other industrial works are much in evidence.

The policies having been well laid out by the last proprietor, very little beyond widening the paths was required to make available for public use the main portion of the property, especially the beautifully wooded glen through which flows a stream whose pristine purity is frequently marred by unsavoury abominations from chemical and other works beyond the city boundaries. The mansion has been adapted as a branch of the Natural History Section of the Corporation Museums. The gift of his glass-houses and collection of plants by a former chairman of the Parks Committee to the park

formed the nucleus of a fine range of conservatories which are open daily to the public, who enjoy seeing more orchids there than probably will be found in any public park in this country. There are three bowling-greens, bandstand, &c. Football and cricket pitches were being formed, but, as the areas were requisitioned for garden allotments during the War, some time must elapse ere these games can be accommodated.

RICHMOND PARK.

Attempts were made for many years, with the view of meeting the requirements of the residents in the matter of recreation ground in the industrial area south of the River Clyde, to purchase what to all intents and purposes was waste ground badly broken up by mining operations in extracting the underlying coal, but the price asked was prohibitive. However, in 1898, through the exertions of Sir DAVID RICHMOND, who was Lord Provost at the time, a settlement was effected at two-thirds less than what was originally demanded. The price paid, £1,000 an acre, was heavy enough; but the transformation of a wretched piece of land, with only a few blocks of miners' houses thereon, and these not of a high class, with hardly a tree or bush on its surface, to a well-ordered park, fully equipped with bowling-greens, yacht pond, children's playgrounds, &c., is a matter of satisfaction to all interested in municipal work who are desirous of improving the amenities of the city. The difficulties attendant on getting trees and shrubs established are gradually being overcome, and, despite the destructive tendencies of the rising generation, the arboreal vegetation is fairly satisfactory.

ROUKEN GLEN PARK.

This unique property, which is about six miles from the centre of the city, was given in 1906 to the Corporation as a public park by Lord ROWALLAN. In these 135 acres stand the mansion-house, gardens and policies, and the glen known locally as the "Rouken." Some maintain that the term was originally "Reekin," literally "smoking" in English, from the fact that under certain conditions the spray from the waterfall created an appearance of mist or smoke. The popular name "Rouken Glen" was applied to the park to distinguish it from the estate generally of Thornliebank.

The natural beauty of the place, with its pretty waterfall and stream, along with the nicely-wooded glen and fine trees throughout the grounds, at once appealed to the citizens, and despite its distance from the city it immediately became a popular resort, especially on Saturdays and Sundays. The Corporation Tramways Department quickly realized the possibilities of the place, and extended their system to it by laying a double-lined track. This proving inadequate, they made further extensions by connecting the lines to those in Pollokshaws, and by so doing the public have now a choice of two

routes, which in fine weather and on Sunday afternoons and evenings are overtaxed with a one-minute service of cars. Beyond widening the existing paths and forming new ones to connect and link up accesses to various points, to meet the requirements of the crowds of visitors, no general alterations were made on the grounds. The endeavour has been to retain the natural features in every possible way. The natural seclusion is such that, though within half a mile of the large dyeing and bleaching works of Thornliebank, not a sign of any important industry in the near proximity is visible, except from a high point in the grounds, from which two or three tall chimney-stacks can be seen.

Of the many munificent gifts made to the city by its wealthy sons, none has surpassed in usefulness and appreciation this princely gift by Lord ROWALLAN, whose liberality will be again alluded to.

POLLOKSHAWS PARK.

With the extension of the city boundaries in 1912, when the burghs of Pollokshaws, Govan, and Partick were absorbed, the parks belonging to these communities came within the city. Of those belonging to the old-fashioned burgh of Pollokshaws little need be said, as they are but minor open spaces—though in a short time a park will be formed, as Sir JOHN STIRLING MAXWELL has recently given 13 acres to extend the largest of the open spaces.

ELDER PARK.

Of the parks belonging to the old burgh of Govan, the principal is the Elder Park, given by the late Mrs. JOHN ELDER in 1885. The area is 35 acres, and is on the opposite side of the street from the famous Fairfield Shipbuilding Yard, of which her husband was long the head and moving spirit. It is furnished with a model yacht pond, good shelters and bowling-greens, with nice open spaces for the children, but one of the provisions of the deed of gift is the prohibition of football—a somewhat sore point with the rising generation.

PLANTATION PARK.

The other park which belonged to the burgh is Plantation Park, which is over 1½ miles from the Elder Park. Its original area was about 7½ acres, but since the amalgamation with Glasgow an additional 7½ acres have been acquired, which will be laid out for football and other games to meet the needs of the youngsters of a densely crowded area. Meanwhile it is occupied by garden allotments.

VICTORIA PARK.

This was the principal park of the burgh of Partick. This park was not purchased by the burgh commissioners, but feued from the Scotstoun estate at a low sum per annum, with the proviso that

should Partick ever become part of Glasgow the annual amount payable would be the building site price. The sum payable is £355 per annum! The original 45½ acres has been twice added to, so that now its area is fully 65 acres. It is equipped with a bandstand, shelters, football ground, and swings for the children. The glory of the place, however, is the world-famous "Fossil Grove," in which the basal stumps of arboreal horsetails and other forms of vegetation of the pre-glacial period are *in situ*. The further preservation of this place, and the development of its surroundings, were under consideration when the Great War put a stop to all schemes of new work.

LOCH LOMOND PARK.

The most notable addition to the city's parks within recent years was the purchase of Balloch Castle estate, situated on the east side of Loch Lomond, and twenty miles from Glasgow. The acquisition of this estate of 812 acres, to furnish a park where the citizens could spend a holiday by the side of the famous Loch, created keen interest far beyond the city bounds. The Corporation had to obtain special powers from Parliament before it could be purchased and maintained from the city rates. The estate comprises four farms and the castle policies. It is the latter part, extending to not less than 200 acres, which has been set aside as a public park. The western frontage extends along the shore of Loch Lomond for fully a mile.

Though somewhat distant from the city, it is already a popular resort during the summer months on Saturdays and Sundays, as well as on public holidays, and will be more so when railway facilities are again normal. During the past two years it has been extremely popular with the Overseas troops, Australians and New Zealanders predominating. Their interest in the country of ROB ROY was intense, while their knowledge of the local history was fuller than that of most of the natives.

Apart from the requirements of the general holiday-maker and the historical associations of the district, there are great possibilities here from the horticultural and arboricultural aspect. Over fifty years ago a considerable number of rare trees and shrubs had been planted, and though the place had been somewhat neglected and much damage done by storms during the past twenty-five years, sufficient evidence remains of the potentialities of the situation. Meanwhile, plans are being formed which, if carried out, will enhance the interest and beauty of this unique park.

MINOR OPEN SPACES.

Of the many minor spaces throughout the city, most of which are administered by the Parks Department—the others being a charge of the Sanitary Department—few call for special comment. Mention may be made, however, of three, varying in character and

equipment, as showing difference of ideas in the laying-out of such places.

Phoenix Park.—The acquisition in 1893 of the site, extending to about $2\frac{1}{2}$ acres, of the Old Phoenix Foundry by the Corporation was a notable event in the history of its Health Department, as it marked the beginning of that department's work in providing open spaces in densely-congested districts. Much public interest was manifested in the work and in the equipment of the place. Local gentlemen provided a bandstand and an ornamental fountain, while trees and shrubs were planted around the margins. The place, however, was not protected by an unclimbable fence, with the result that the shrubs soon disappeared, and now only a few of the larger-growing trees exist.

Govanhill Grounds.—In comparison, in 1894, the site of an old brick-field, extending to about 4 acres, in the Govanhill district, was acquired by the Parks Department and laid out on quite different lines. It was enclosed with an unclimbable fence, with the result that hardly a tree has been injured, and the majority are vigorous-looking and twenty feet high on an average. Of all the open spaces in the city it commends itself to strangers visiting the city and studying the question of open spaces.

The third is the *Balgray Pleasure Ground*, in the north-east or Springburn district of the city. This was occupied by a number of small half-slum houses, as well as a fairly good modern tenement, all of which were purchased and the area cleared and laid out at the expense of Mr. HUGH REID, LL.D., the senior member of a most generous family, who wanted the children of that populous district to have a playground within easy reach. It is admirably equipped with the most modern type of appliances suited for young children. The area does not admit of games such as football, but provision is made for old men in the shape of smoking and reading rooms. This place is also enclosed with a suitable railing, with the result that the trees and shrubs are undamaged and thriving well, adding much to the interest of the place, which in itself has improved the amenity of the district in no small degree.

RECENT GIFTS.

Before closing mention must be made of recent gifts by generous landowners. In 1914 Lord GLENCONNER gave $13\frac{1}{2}$ acres of land to form a recreation park in the densely-populated and smoky district of St. Rollox. This will be laid out chiefly in football pitches, along with bowling-greens and gymnastic appliances for children.

In the Newlands district $13\frac{1}{2}$ acres were given by Sir JOHN STIRLING MAXWELL of Pollok for parks purposes, but the area has been temporarily laid out in garden allotments. It is expected that by 1920 operations to lay out the park will be commenced.

Another gift of 13 acres has recently been made by Sir JOHN

STIRLING MAXWELL to increase the small park of Greenbank, in the Pollokshaws district. This is to be entirely laid out for games, to meet the necessities of the rising generation of a growing residential district, as well as those of the old burgh of Pollokshaws. Meanwhile, it also is under garden allotments and agriculture.

Within the past month an area of 6 acres has been given by Sir ARCHIBALD CAMPBELL of Garscube to form a playground and recreation centre at Temple, in the north-west district of the city, which has also a growing population.

PLANTS.

Regarding trees and shrubs, visitors and citizens, as well as strangers, frequently remark on the absence from our parks of certain species of trees and shrubs. Apart from the vagaries of climate, the geological and physical conditions of the locality require to be considered. Though the annual rainfall is fairly heavy, averaging nearly 40 inches, that would not be a serious objection were the natural soil of a free gravelly nature, but unfortunately much of the soil in the district is boulder clay, through which water percolates slowly, and therefore the soil is naturally cold. Consequently it is unsuitable for many beautiful species of trees and shrubs; while in addition there is the smoke-fiend, common in all crowded areas, but intensified an hundredfold in a busy manufacturing city by the multifarious emanations from its various works chemical and mechanical, which poison and destroy all but the hardiest forms of plant-life. Our soot deposit is 200 tons per square kilometre per annum. Under such adverse conditions it is obvious that care and discrimination are very necessary in the selection of trees and shrubs to suit the exigencies of the situation. The list which will be given is somewhat meagre considering the vast amount of interesting trees and shrubs in cultivation in this country. It is one, however, based on close observation and study of the subject. Generally speaking, deciduous trees and shrubs are the most suitable, and a larger selection can be made from that class. The difficulty is, however, great in regard to evergreens. No large-growing evergreen trees are available, as none of the fir and pine tribe will thrive amidst the smoke and dirt of the city. A few of the smaller-growing species may exist for a time, but by no stretch of imagination can they be said to succeed. Our best evergreen shrubs are those which have smooth convex-shaped leaves, such as all broad-leaved hollies of the Hodgins class, Aucubas, Rhododendrons of the *calawbiense* type, and smooth-leaved plants generally, excluding, however, common and Portugal laurels, which are not good smoke-resisters nor suitable for wind-swept places. To widen the field of selection, experiments have been made by planting a wide variety of species under diverse conditions, and valuable lessons have resulted therefrom.

Turning from the higher to the more lowly, nearly all herbaceous

plants succeed, at any rate sufficiently to produce something of interest during nine months of the year at least, in comparison with the four months of the ordinary summer bedding plants—a fact which the public seem to appreciate very fully.

Allusion must also be made to a phase of horticulture which is somewhat uncommon in public parks, but which is a unique feature in those of Glasgow, and that is the number of winter gardens and glass-houses in which are cultivated good general collections of pot plants. Apart from the splendid ranges of glass-houses at the Botanic Gardens, there are conservatories or winter gardens in Glasgow Green, Tollcross, Springburn, and Queen's Park, all open daily to the public, whose appreciation may be gauged by the attendances. For example, one year when the Chrysanthemums were in bloom at Queen's Park, a census was taken of the visitors on a Sunday, and the number was over 7,000 within four hours. The houses at Camphill, in Queen's Park, were primarily intended as a propagating centre for plants to supply the newer parks, as well as for decorating the City Chambers on the occasion of civic functions, but owing to the interest shown in these houses by the public it was decided to open them daily from 12 till 5 p.m.; and the results have fully justified the action.

Amongst the large number of ordinary decorative plants cultivated, the Department have gradually gathered a good representative collection of Orchids, which have proved a feature extremely interesting to, and appreciated by, the public, and a matter of surprise to strangers. We grow about 10,000 *Odontoglossums*, *Cypripediums*, *Dendrobiums*, and other genera. The first two named we find the most useful for our purposes, and less liable to suffer from fogs than *Cattleyas*, *Laelias*, &c.

MUSIC.

Provision is made for music during the summer months in all the principal parks, as well as in a few of the smaller. Eighteen of the parks and open spaces are provided with bandstands. The old idea that a bandstand should be perched on some eminence or made an outstanding architectural feature has been abandoned, and our newer erections are built to meet the views of musical experts—with, on the whole, fairly satisfactory results. In previous years, prior to the War, 390 performances were annually given throughout the parks.

A few years ago a new development, in the way of musical entertainments, was made by the engaging of concert parties, who give two concerts daily in certain parks. Whatever opinion may be held as to the wisdom or propriety of such performances being given in public parks by municipal authorities, there is no doubt, judging from the attendances, that a section of the public seem to enjoy them. The latest innovation is that of Sunday afternoon concerts

in the principal parks and in the winter gardens at Glasgow Green, and here again, judging by the attendances, the public appreciate the performances.

While local bands supply the majority of performances, the Corporation engage some of the leading military bands from London, as well as other noted bands in England. By Act of Parliament the Corporation can spend up to £4,000 a year on music.

RECREATIONS.

The increasing demand for means of outdoor recreation and amusement in the public parks has received much serious and careful consideration from the Committee of Management. The tendency is towards more and larger areas for active games, especially football. Unfortunately, the devotees of that most excellent game are not always sportsmen, and their actions and language are frequently objectionable; while the amenities of a park are very materially affected by an excess of football play. Why there should be more undesirable features connected with the playing of football than in other games has always been to me a puzzling question. The same cannot be said of cricket, golf, or hockey, though all require large areas for play. The restricted areas required for croquet, tennis, and bowling are much more easily met.

In regard to football, provision has been made for fifty-two pitches. For cricket, which is not such a popular game in Scotland as football, there are six pitches in four parks only. On the other hand, bowling is extremely popular, and thirty-eight greens are distributed in fifteen parks. Tennis courts are provided in several, but the demand is limited, while for croquet it is even less.

One feature peculiar to the west of Scotland is the provision of ponds in public parks for the sailing of model yachts, and seven of our parks are equipped with these.

As the shipbuilding industry is one of supreme importance on the Clyde, the sailing of yachts for pleasure or racing was in pre-war days one of the most popular recreations during the summer months. The desire to sail model yachts is a reflex of the sport by those who are unable to enjoy the full-fledged game, and consequently many artisans build model yachts to scale and sail them in the ponds of our public parks, having regular clubs who hold regattas and race their boats for prizes. The small boy has not, therefore, got it all his own way with the ponds. All games are under regulation, as the aim is to give every section of the community a fair share of enjoyment in their own particular sport. Unfortunately we have not yet boating ponds, though we trust such will be provided in the near future.

Gymnastic appliances are provided in all parks to a greater or less extent, while a few possess well-equipped open-air gymnasia.

ARDGOIL ESTATE.

One cannot conclude this somewhat lengthy description of the public parks of the city without mentioning Ardgail estate, extending to 14,740 acres, which was presented to the Corporation in 1906 by Mr. CAMERON CORBETT, now Lord ROWALLAN. This great gift, which comprises the ridge of hills between Loch Long and Loch Goil, and northward across Glencroe to the top of Ben Ime, is typical of much of the West Highland scenery, and is probably one of the wildest parts of the Cowal district of Argyllshire. The desire of the generous donor was to give the citizens of his native city a place whereon they could have every freedom, consistent with the preservation of the natural features of the situation. Its distance from Glasgow, some forty miles, no doubt detracts somewhat from its value as a place of public resort. While it was fairly well served by steamers during the summer months prior to the War, since the outbreak of hostilities and the commandeering of the steamboats it has been practically isolated, as the miserable mail-boat was quite inadequate to cope with the traffic. The Corporation for several seasons before the War chartered a steamer, and gave the wives and children of the poorer classes an outing to their Highland estate. The estate is divided into four sheep farms. In 1913 a scheme of afforestation was inaugurated, and several hundred acres have already been planted with various coniferous trees. The prospects of success are such that at no distant date additional areas will be marked off for planting.

EDUCATIONAL GARDENS.

By JAMIESON B. HURRY, M.A., M.D., of Westfield, Reading.

THE Educational Garden is an essential adjunct to up-to-date teaching, and should be available for every town or country school. In rural districts the provision of the land required, which need not be extensive, should present no great difficulty, while in towns or cities suitable plots could generally be found in one of the parks or gardens belonging to the Public Authority. To what better use can a corner of such parks be put? In addition to promoting health and recreation they would then become a valuable aid to instruction.

The advantages to be derived from Educational Gardens may be grouped under three headings, although an indefinite number of combinations may be arranged. Such gardens may be used as a means of instruction in (a) Horticulture; (b) Botany; (c) Industry and Commerce. The form of garden laid out will vary according to the special objects in view.

(a) Horticulture.

The central idea of the School Garden, as generally planned in connexion with elementary schools, is the teaching of simple horticulture, so that boys and girls may be familiarized with the principles and practice of gardening. The requirements of a cottage garden, including the cultivation of the common vegetables and flowers, are kept in the foreground. The preparation and manuring of the land, the selection of seeds, the details of planting and watering, the grafting and pruning of trees, the gathering and preservation of vegetables, fruit and seeds, the destruction of pests and so forth are all carried out by the children under skilled supervision, every effort being made to encourage individual taste and experiment.

The fresh-air occupation thus provided, although valuable to all, will be found specially suited to certain classes of children who take more kindly to manual than to book work. They are unfitted for dealing with abstract ideas, but make progress when face to face with concrete objects and subjects. Other children may be pre-disposed to tuberculosis and need an extra amount of open-air life if they are to grow up robust. Further, the moral and mental training associated with such an occupation as horticulture will be found beneficial in a high degree, and serve as an introduction to work on the land in future years. The powers of observation are stimulated, and a taste for rural life and occupations is cultivated.

Great progress has been made during recent years in the teaching of horticulture in evening schools, in combination with some practical work in school gardens. Such evening classes are attended by older

children, to whom more advanced instruction can be given. The utilitarian aspect is also kept in view, the children being encouraged to earn some money by means of the produce raised in the gardens or allotments. Moreover, it must never be forgotten that development of the brain proceeds *pari passu* with increasing agility of the muscles.

In secondary schools many of the same principles may be aimed at as in the public elementary schools, although the decorative side of the garden as opposed to its purely economic aspect receives greater consideration. Infinite variety of management will suggest itself to the instructor with imagination. KIPLING's poem "The Glory of the Garden" will open children's eyes to the romance associated with even a child's plot of flowers and vegetables.

A number of excellent manuals have been published giving full details as to the management of gardens in which the teaching of elementary horticulture is the main object in view.

(b) *Botany.*

The School Garden may also be planned to subserve the teaching of botany, and will go far to give life and interest to that science. Plots may be laid out so as to illustrate the natural orders of the vegetable kingdom, excursions being organized in search of plants required to fill gaps. With the garden may be associated an herbarium in which are preserved specimens for use during the winter months when Nature is resting.

Such a garden will provide a regular supply of plants for dissection and illustration, thus promoting the habit of personal examination of plants in lieu of reliance on second-hand authority, as represented by the printed book and picture.

The fundamental phenomena of vegetable physiology form an admirable introduction to those of animal, including human, physiology, throwing a flood of light on such problems as growth, circulation, respiration, digestion, nutrition, and reproduction.

Incidentally such a botanical garden will also help to illustrate principles of geology, of climate, of meteorology, of plant distribution, and so forth.

(c) *Industry and Commerce.*

Lastly, an Educational Garden may be used for giving instruction in the principal plants used in industry and commerce. This suggestion is somewhat novel, and may therefore be described in greater detail. Moreover, this form of Educational Garden has been in actual operation for several years and may, therefore, be said to have passed the experimental stage.

A brief account of the scheme as carried out at Westfield, Reading, may be of interest. The object in view is to give the public, especially teachers and children, an opportunity to study some of the more important plants used in industry and commerce. The scheme comprises four sections.

(1) *The Economic Border* is a long border, in which are arranged a number of plots containing several series of economic plants. Series I. includes plants that supply medicines, *e.g.*, opium poppy, belladonna, liquorice, hemlock, henbane, cinchona, castor-oil, aconite, eucalyptus, turpentine, valerian, jalap, podophyllum, rhubarb, Indian hemp. Series II. includes plants that supply foods, *e.g.*, rice, sugarcane, sugar-beet, millet, pepper, lentil, mustard, olive, arrowroot, cardamom, maize, monkey-nuts. Series III. includes plants that supply fibre, *e.g.*, jute, cotton, flax, hemp, mallow, ramie, papyrus, New Zealand flax, sisal hemp. Series IV. includes plants that supply dyes, *e.g.*, annatto, woad, indigo, madder, turmeric, sumach, weld, dyers' buckthorn.

Some of these plants are quite hardy and live out of doors all the year round. Others must be kept in a heated conservatory during an English winter, and be planted out in a sheltered border during the summer.

(2) *The Economic Conservatory*.—In this grow a variety of plants which are too delicate to be grown in the open air, *e.g.*, tea, coffee, ginger, guava, custard-apple, banana, date palm, oil palm, pine-apple, vanilla.

(3) *The Old English Herbarium*.—This consists of a series of plots in which are arranged about sixty herbs cultivated in medieval English gardens. Many of these herbs are mentioned by Shakespeare, Chaucer, Spenser, and other early writers, and were used for homely remedies, or for pottage, sauce, salad, or scent. This section will be full of interest in connexion with English literature as well as medieval home life and customs. A glance at such a volume as ELLACOMBE'S "Plant-lore and Garden-craft of Shakespeare" will at once suggest practical applications of such a herb garden in education.

The following is a list of the herbs grown at Reading:

Alecost.	Elecampane.	Samphire.
Angelica.	Fennel.	Savory, summer.
Aniseed.	Feverfew.	Savory, winter.
Arnica.	Golden Rod.	Sea Holly.
Asarabacca.	Horehound.	Skirrets.
Balm, common.	Horse-radish.	Sneezewort.
Balm of Gilead.	Hyssop.	Soapwort.
Basil, bush.	Lavender, purple.	Solomon's Seal.
Basil, sweet.	Lavender, white.	Sorrel.
Bergamot.	Mallow.	Southernwood.
Borage.	Marigold.	Spikenard.
Burdock.	Marjoram, pot.	Sweet Cicely.
Burnet.	Marjoram, sweet.	Sweet Flag.
Caper Spurge.	Mint.	Sweet Maudlin.
Caraway.	Mugwort.	Tansy.
Cardoon.	Mullein.	Tarragon.
Cat Mint.	Musk.	Thrift.
Chamomile.	Orache.	Thyme, common.
Chervil.	Parsley.	Thyme, lemon.
Chives.	Pennyroyal.	Thyme, purple.
Clary.	Peppermint.	Thyme, silver.
Comfrey.	Purslane.	Thyme, woolly.
Coriander.	Rosemary.	Valerian, red.
Cotton lavender.	Rue.	Verbena, lemon-scented.
Cumin.	Sage, common.	Vervain.
Dill.	Sage, purple.	Wormwood.

(4) *The Economic Museum*.—This is a large room in which are exhibited various commercial products yielded by plants grown in the Economic Border and Conservatory, with the object of teaching children to associate economic products with the plants from which they are obtained.

Thus opium, liquorice, eucalyptus, castor-oil, quinine, rhubarb, belladonna, turpentine illustrate some of the products of the medicinal plants. Rice, arrowroot, cane-sugar, beet-sugar, mustard, pepper, lentils, corn-flour, olives, monkey-nuts illustrate some products of the food-plants. Flax, cotton, ramie, jute, hemp, *Phormium tenax*, sisal hemp illustrate the products of fibre-yielding plants; while various pigments such as annatto, turmeric, woad, indigo, madder, fustic, weld, buckthorn render a similar service for the dye-yielding plants. In every case detailed descriptive labels are attached so that the exhibits are made as educational as possible.

The Educational Garden, with its Conservatory and Economic Museum, is thrown open to the public on several half-holidays, including Sunday, during the summer, and has been visited by many thousands of teachers and school-children as well as by the public, who seem to appreciate the somewhat novel educational opportunities provided. Indeed, both teachers and pupils often bring note-books as an aid to future study.

The scheme here described in detail has been carried out in a private garden, and the experiment seems to have been justified by its success. But if the scheme is deserving of a wider trial, a more permanent and public basis is desirable.

In many cases schools already have land attached to them which might be utilized for some portions of the arrangement suggested above. A humble beginning may be gradually developed until a most interesting Educational Garden has been established.

Our public Education Committees could facilitate the provision of such Educational Gardens by allocating one of the gardens under their control. In the case of towns a single plot of ground illustrating economic and industrial botany would probably suffice, as it could be visited by the pupils from a number of schools, and would also supply them with the necessary specimens for dissection and study.

A third possibility lies in the provision of Educational Gardens by our Municipal Authorities in one of the parks or gardens which they control. Such parks and gardens are already of priceless value to the community as sources of health, recreation, and refreshment. By the addition of such an educational section they would add yet another benefit to those they already provide.

A Catalogue has been printed for the use of visitors to the Reading garden, and will be sent gratis to any public authority interested in the scheme on application to me

CONFERENCE ON FRUIT-GROWING.

At R.H.S. Spring Meeting at Chelsea, May 21, 1919.

[The Conference was under the joint auspices of the Royal Horticultural Society and the Chamber of Horticulture. The Chair was occupied by Mr. GEORGE MONRO, jun., and there was a large and attentive audience.]

THE CHAIRMAN, in opening the proceedings, said: We thought it a good opportunity on the occasion of the Chelsea Show, when almost every grower and cultivator interested in horticulture is present in London, to have a Conference on a subject to which some of us attach considerable importance, viz. "the increase of the supply of home-grown fruit," possibly at the expense of decreasing foreign imports. One of the biggest questions we have ahead of us in the future, in view of the financial state of the country as the result of the war, is to produce as much as possible ourselves, and to import as little as possible. This afternoon addresses will be given by four speakers, each of whom will speak about the subject from a different point of view, and after they have finished the meeting will be open for general discussion. We propose to limit the four speakers as nearly as possible to ten minutes each, and in the general discussion I propose to limit the speakers to five minutes each. You will be able to say a good deal in five minutes, and I should like every speaker in the audience to give his name before addressing the meeting. I will now ask Mr. W. LOBJOIT to open the discussion, and he will speak more particularly in regard to distribution.

THE DISTRIBUTION OF FRUIT.

At first sight it may appear that distribution has but a small place in any discussion of methods to increase the supply of fruit. It may be said that the proverb, "First catch your hare before you jug her," applies. On second thoughts, however, it will appear that to produce fruit on a plantation is not the same as to produce it upon the consumer's table. That if the second operation is not possible without the first, the first is, to say the least, incomplete without the second; that, so far as the consumer is concerned, the second is of equal importance with the first. For little is he benefited if the strawberries make lines of luscious scarlet on the fertile wealds of Kent or the sun-warmed slopes of Hampshire, or if the plums bear down the laden limbs of the trees in Worcestershire or Middlesex, or the apple-trees of Hereford and Cambridge make gold and scarlet landscapes, if means exist not for forging up the chain of contact between him and the produce itself. It may also be said that the main proposition

deploys on two lines, viz. that the fruit must be put upon the consumer's table with the smallest loss possible of freshness and natural bloom; and that those who perform any service in the chain of transportation between grower and consumer must have what is fair, and only what is fair, for the service each renders, while the route must be protected from every highwayman-like claim without necessary service rendered; so that the step up between the cost as the fruit leaves the grower and that at which it touches the palate of the eater shall be natural and reasonable because composed of only necessary accretions.

Thus to state the problem is simple enough. To state also, that, except in some special cases, neither of the desiderata of efficient distribution is in fact accomplished, is to run little risk of having to meet serious opposition. To indicate the manner in which efficient distribution can be achieved—or at least how the existing standard can be improved—is neither simple nor free from controversial risks. Yet this, without doubt, is the object of the discussion upon which we are now embarked.

There are four lines of contact between the fruit-grower and the fruit-eater at the present moment in operation. Beginning with the longest and least direct and finishing with the shortest and direct, they are: (1) The *grower*—the *local railway station*—the *railway terminus*—the *market salesman*—the *retailer*—the *eater*. (2) The *grower*—the *market*—the *retailer*—the *eater*. (3) The *grower*—the *retailer*—the *eater*. (4) The *grower*—the *eater*.

The amount of fruit passing along these lines is greatest in the case of the first, and decreases with each line to the fourth. Between the first and second links in the first line, and the second and third links in the second, there are sometimes inserted links—of the “stand and deliver” type—in the shape of speculators, who perform no necessary service—and the result of whose operations is frequently to increase the cost on the table. In the first it is by buying up large quantities from the grower *in situ*—and so creating some measure of a corner—an operation possible only in years of short supply; in the second by buying up upon the market a large enough proportion of any morning's supply to create a corner for that morning—an operation that, under certain conditions, may be effected even in a year of bountiful supply. The first class of speculation would become more frequently possible with a tariff or restriction of imports, but might result in what would have gone wholly to the grower being shared by the grower and the speculative spider into whose web the grower had walked, and therefore in little if any increase of price to the eater. The second is seldom practised upon salesmen who are always upon the market and who are, or ought to be, “up to” the latest price fluctuations, but is frequently successful in the case of growers who sell their own produce, who come straight from their plantations to the market, and who do not “tumble to what is wanted” until too late. Here the effect may sometimes be that the speculator

and the retailer share what would have been the retailer's profit, and the eater suffers little if any increase of cost; more often, however, it is this last who has to pay for the speculator's little game.

Now it will be agreed that the *fourth* line—that of *grower* and *eater* in direct contact—is the ideal. It will also be agreed that along this line a smaller quantity passes than along either of the three other lines. There are no statistics existing to prove this; the assertion must remain an assertion based upon what is called "common knowledge," and in this state of nakedness it must stand the assault of those who, rightly, demand conclusions based upon statistics.

It is probably this line of direct contact that is in the mind of those whose one prescription for defects of distribution seems to be elimination of the "middle man," or sometimes the variant—"the unnecessary middle man."

A little consideration will make it evident that this line of distribution can never apply to more than a relatively small quantity of produce, and that only where certain clearly defined local conditions obtain. There must be just enough of orders as produce to dispose of, and just as much produce as orders to be satisfied; or else some orders are left unfulfilled, or, on the other hand, some produce is wanting customers. Moreover, the quality must be maintained at the desired level from day to day. Now, everyone with practical knowledge knows that these several conditions never run long together. An association of growers in co-operation may secure their fulfilment over a longer period than any single grower. But sooner or later the eater finds he must draw his supplies from a wider range; and always the grower has grades of produce that he must send to a mart for disposal. A great enthusiasm has more than once been excited by the idea of postal supply direct from grower to eater. If there had been half the advantages in the system claimed for it, there has been time enough for it to have overspread the land.

That each boom has had a hectic popularity of a few months, and then died back to the normal trickle, is evidence enough that it is calculated to meet the convenience of a few only.

When I was a boy, along the broad road from Hammersmith Bridge to the "Red Lion" there was on each side a fringe of gardens where strawberries were skilfully cultivated. Upon any day in the strawberry season, lines of carriages might be seen, whose occupants had come out from fashionable London to secure fresh-gathered fruit for dessert. This affords an illustration of the conditions under which direct contact between grower and eater is possible—and it gives clear indication how narrow those conditions are.

The line *grower—retailer—eater* is a line of contact which, so far as it can be utilized, gives the eater good promise of receiving the produce in a condition of natural freshness. With the development of motor transport, and the association of growers in distributive units—that the pressure of circumstances and the result of enlightened outlook may lead one to hope for—this line of contact is capable of

considerable extension. It can never, however, account for more than a part of the problem of distribution.

The average English housewife draws her daily supplies from a wide area of the earth's surface. She cannot be restricted to part of a county—nor to one county—nor to one country—nor to one continent. That is why she needs a retailer to supply her wants. That is why the retailer must have a market at which he can find, concentrated, produce from every producing zone.

The line *grower—market—retailer—eater* accounts for a larger part of the produce than either of the two last under consideration.

It is chiefly restricted to produce grown near enough to market to be road-borne direct from the grower's premises to the market. It ought to ensure that the produce reaches the eater without too much handling. It must have occurred to our forefathers in very early times, and long satisfied all requirements.

As practised to-day, however, it has serious drawbacks. If one considers what the possibilities are from organization one may say that the eater has a right to demand more attention to his desires than this crude system—or want of it—generally gives him. In the first place, it assumes that every grower is a salesman, which is far from the case. In the next it results in produce being put upon the markets in almost infinite degrees of grading, packing, or absence of either or both, besides taking numbers of men from their holdings to do what, with organization, one or two could do better.

When all is said, the line the *grower—the local railway station—the railway terminus—the market salesman—the retailer—the eater* is that along which the bulk of the fruit crop must travel. Nor is it easy to see how any of the links can be cut out to shorten the chain. Are we then living in the best of all worlds? Is there no opening for improvement? Everyone who has examined the question will agree that there is ample scope. Where, then, can improvement be sought? There are three avenues of approach. They rest with the *grower—the railway—the salesman*. With the *grower* it rests to associate for securing established standards of grading and packing, and for placing produce upon the railway in bulk at convenient centres for entraining. If each fruit-growing centre had its distinctive grade and mark, how the work of the salesman would be simplified, and how much better the returns to the individual grower would be! How is it possible for the salesman to do justice to every sender of ungraded, ill-packed little cotechs of produce—some of which must inevitably get "on show" after the cream of the market has been skimmed off? The retailer and the eater together have just reason to condemn sixteenth-century methods in this wide-awake twentieth century.

The grading and packing installations could be established as in America, close to the forwarding station on the railway, so that there need be no additional carting.

With the *railway* there should be properly constructed wagons—preferably with transferable containers, so that goods could be

transhipped from rail on to motor wagon for conveyance to market salesman without rehandling. With produce bulked and ready at the forwarding stations, trains could be run at times convenient for the proper dealing with the produce, and loss from late arrivals should be rare occurrences.

The scales of rates should be radically revised. The whole community has just reason to complain of the present antiquated classification—which dates from the time, when—for instance—tomatos were a curiosity and no imagination pictured them in tons. The unjust conditions of the owner's risk rate, which free the railway companies of the ordinary carrier's responsibility, should be amended in favour of a reasonable charge and reasonable conditions comparable to the service demanded of the company, and imposing upon them and their servants responsibility—not for wilful negligence only—which can never be proved—but for culpable carelessness also.

In times of "glut" special low rates should be put in force for produce loaded in bulk, so that the consumer shall not be cheated of his share in Nature's bounty because it will not pay to send the fruit to market. Doubtless the railways perform a public service when special trains are organized to convey the patrons of the Turf to the race meetings. Would it be any less of a public service if the running of special fast trains for conveyance of fruit and vegetables were developed?

Much fruit would be saved from waste in times of glut if arrangements were made for delivering direct to the jam-boiler.

From the *salesman* there must be demanded an effort to meet the difficulties of the retailer, which hinder the distribution of produce, especially in periods of great plenty.

Let anyone consider the position of the retailer. His wares are of the most perishable character. To overbuy in any article may mean loss, cancelling the earnings of a whole day. To get his wares home, he must get up in the small hours of the morning—go to market with his own conveyance and carry back his own purchases. Compare this with the case of, say, the draper. His wares are not perishable, except from the exigencies of fashion; they are brought by direct delivery or carrier; if the demand for his goods increases, he can telephone to his wholesaler for fresh supplies. Can it be marvelled at that under present conditions, at times of great plenty—when the percentage of profit is a small margin, the public do not reap the full benefit? Adding all the handicaps—unorganized growers, small accommodation between grower and railway, unfair rates, uncertain deliveries, the temptations to the retailer to make his profit by handling the minimum quantity of produce—would it be wonderful if some truth existed in the stories read in newspapers of fruit ungathered—lying rotting—because it would not pay to forward it?

The *salesman*, besides securing modernizing of market arrangements for receiving and forwarding produce—must organize deliveries

direct to retailers at any hour of the day. By this means the packing of the business into a few early morning hours would be modified. Stuff coming into the market late in the day might go at once to the retailer without having to wait until next morning's market. The retailer would be led to adopt a less cautious policy and would handle a greater bulk of stuff. If the use of the telephone became general among growers, it would enable the salesman to keep in touch and advise them as to forwarding produce. A grading and packing expert might be sent by the salesman to instruct and advise the back numbers among his clients.

But for the grower the spirit of the times is shouting that salvation lies only in combination and co-operation. He that hath ears to hear, let him hear.

The CHAIRMAN then called upon Mr. F. SMITH for his paper on

VARIETIES FOR MARKET AND FOR PRIVATE GARDENS.

I have been asked to give you a list of the useful varieties of fruit to plant, in order to increase the home-grown supplies. I can strongly recommend from personal experience the varieties I shall name as reliable market sorts. Intending planters must not trust blindly to any given list of varieties, but find out those which do well in their own particular districts and make them their main crop. Some of the varieties I recommend may not be suited to all soils.

I will begin with kitchen apples, which must be large in order to please the cook and the many who say with the miners that they want something big enough to put a bit of crust round. The trees should be free croppers, and the least susceptible to disease. I think the best are as follows:—'Early Victoria,' 'Grenadier,' 'Stirling Castle' (this objects to sprays containing sulphur), 'Lord Derby,' 'Lane's Prince Albert' (best as a dwarf), 'Norfolk Beauty,' 'Bramley's Seedling,' 'Newton Wonder' (this will not stand sulphur in any form).

I now come to dessert apples. There is a large field here for the hybridizer, because we have very few commercial apples which have quality, colour, and a good constitution. Our raisers of new apples cannot get away from 'Cox's Orange' as one parent, but it is far too delicate. What is badly wanted is something to compete with American apples from December to the end of March, when Australian fruit comes in, and I believe this can be got if our specialists will give it their attention. The varieties I recommend are 'Gladstone,' a very old variety from Warwickshire, which does best on 'Paradise Stock.' I had grafts of this forty years ago from a tree about one hundred years old. Then there is 'Beauty of Bath' (on 'Paradise'), also 'Worcester,' 'Rival,' 'Allington,' and 'James Grieve.'

With regard to pears I would mention 'Fertility,' 'Doctor Jules Guyot,' 'Conference,' and 'Windsor Wonder' for grafting on any variety that does not succeed. It is a fairly good stewing pear, and a great cropper.

Plums :—‘ Rivers’ Early,’ crops well on grass, but not on cultivated ground ; ‘ Czar,’ ‘ Purple Egg-Plum,’ ‘ Victoria,’ ‘ Veitch’s Black Bullace’ (‘ Langley Bullace’), which is first-rate for bottling.

Gooseberries :—‘ May Duke,’ which was grown in Kent fifty years ago as ‘ Bank of England’—it does not do under trees, but is good in the open ; ‘ Careless,’ ‘ White Lion,’ and ‘ Lancashire Lad.’

Black currants :—‘ Baldwin,’ ‘ Seabrook’s Black,’ ‘ French.’

Red currants :—‘ Skinner’s Early,’ ‘ Dutch’ (of upright growth), and ‘ Raby Castle.’ I should like to mention, however, that there is great confusion in the names of red currants, because they are different in different parts of the country.

Raspberries :—‘ Bath’s Perfection,’ ‘ Hornet,’ ‘ Pine’s Royal.’

Strawberries :—‘ Royal Sovereign,’ and ‘ Stirling Castle’ for jam.

Loganberries do well on the American system of training, but must not be raised from seed, otherwise you get all kinds of varieties.

Cherries :—‘ Early Rivers,’ ‘ Waterloo,’ ‘ Kentish Bigarreau,’ ‘ Napoleon,’ ‘ Kentish,’ and if you have a spare corner Quince ‘ Champion’ is good.

I was horrified to find upon coming here this afternoon that I was supposed to give a list of garden varieties, and as I was not warned in time I have not prepared any list. However, I have jotted down a few since I have been here.

Dessert Apples :—‘ Miller’s Seedling,’ ‘ Benoni,’ ‘ Cox’s Orange Pippin,’ ‘ Charles Ross,’ and ‘ Sturmer’ (very late).

Pears :—‘ Louise Bonne of Jersey,’ ‘ Doyenné du Comice.’

Plums :—‘ Green Gage,’ ‘ Jefferson.’

Gooseberries :—‘ Yellow Rough,’ and ‘ Warrington’ (for bottling).

Raspberries :—‘ Superlative.’

That is my list, but if I had received longer notice I would have given you the names of other good garden varieties. It is a most difficult subject, however, and it is particularly desirable that intending growers should find out, each in his own district, which varieties will there do best.

The CHAIRMAN then called upon Prof. E. S. SALMON, Mycologist to the South-Eastern Agricultural College, to read his paper on

THE GROWING OF CLEAN FRUIT.

I have been asked to speak on the subject of the “growing of clean fruit,” in other words, on the control of those fungus and insect pests against which the fruit-grower has to wage such a ceaseless warfare.

In reviewing this subject, it will be convenient for us to consider it under four heads :

1. Breeding ;
2. Planting and cultivation ;
3. Direct measures other than spraying ;
4. Spraying.

I. CONTROL OF DISEASE BY BREEDING.

More attention should be paid to the breeding of varieties which are immune or resistant to those diseases which are apt to ruin the crop.

It may not be generally realized what great differences of "constitution" exist in the forms or varieties of one species of plant. Let me give you the facts which I have recently observed in the case of the hop plant and its mildew (*Sphaerotheca Humuli*). I obtained seed of the "wild hop" from Italy, and during the past six years I have raised some 600 seedlings, and tested their susceptibility to mildew. The greater number of these seedlings have proved extremely susceptible to mildew; a small number are strongly resistant or semi-immune, to the mildew, so that they suffer little harm from its attacks; and a small number are absolutely immune to mildew. These seedlings do not shift from one class to another in different seasons, but remain perfectly true to their "constitution" from year to year.

This year, I am testing the commercial varieties of hops in cultivation, and so far it does not appear that any of these were selected originally for any resistance to mildew.

And this is the first point which I wish to emphasize: that more attention should be paid at the very start to combating disease; this can be done by the selection of varieties resistant to disease.

With our present knowledge of the principles of heredity, we have every reason to believe that the character of disease-resistance can be, by the process of hybridization, united to the other desirable characters.

This work of breeding disease-resistant varieties is scarcely one, I think, which the ordinary nurseryman can carry out, because it requires the particular disease against which resistance is sought to be always present in a virulent form—which is not a nice prospect for a nursery!

Research institutions should be deputed to deal with the breeding or testing of plants against particular diseases; here the work would be carried out under specialists who have an intimate knowledge of the diseases in question.

We have new varieties of potatoes immune to "wart disease" being raised by State help, and similar breeding work is urgently required with regard to our various fruits.

It is possible that the different stocks used in growing apples, pears, plums, and cherries may affect their liability to disease. At the East Malling Fruit Experiment Station many different types of Paradise stocks have been collected, and it is intended to investigate the influence of each on the susceptibility to disease or otherwise of the grafted tree.

2. CONTROL OF DISEASE BY PLANTING AND CULTIVATION.

I must refer only very briefly to this part of the subject.

The *site* of fruit plantations should be carefully chosen with reference to the control of disease. Exposure to early or late frosts, or to excessive moisture, will encourage disease. Proximity to woodlands may bring on very bad attacks of caterpillar.

Over-crowding *must* be avoided. Good ventilation is as good as a good spraying. Gooseberry bushes, *e.g.*, must not be planted so close together that there is no room to walk round them to spray them against American Gooseberry-mildew.

Excessive nitrogenous manuring should be avoided.

3. CONTROL OF DISEASE BY DIRECT METHODS OTHER THAN SPRAYING.

This method of dealing with disease is far too often neglected, and I want to drive home this point with what emphasis I can.

Too many fruit-growers are inclined to rely *entirely* on spraying; whereas, good as spraying is against many insect and fungus diseases, it must be remembered that it is *entirely* useless against some of the worst pests.

I will cite instances of some fungus and insect diseases of this class:

"*Silver-leaf*" of *Victoria* (and other) *Plum-trees*.—This disease is caused by the fungus *Stereum purpureum*, which comes to the surface of the stem (or branch) *when the tree (or branch) is dead*, and forms there myriads of its *spores*, which spread the disease to surrounding *Plum-trees*. Every tree killed by *Silver-leaf* and allowed to remain in the garden or plantation is a most prolific source of infection. We could *prevent* *Silver-leaf* if an order could be carried out for the grubbing up and burning of "*silvered*" trees.

Many a fruit-grower has remarked to me—"No cure known for '*Silver-leaf*,' I suppose?"—and continues to leave the dead trees to propagate the disease. Well—perhaps, a Joint Committee of the R.H.S. and the Chamber of Horticulture will one day deal with such offenders!

Apple "*canker*" is in the same class; spraying is of no use, and the knife is the remedy in cutting out the cankers: or, in really bad cases, top-grafting with strong-growing canker-resistant varieties—such as '*Bramley's Seedling*' or '*Newton Wonder*'—must be employed.

I should like to refer here to the '*Brown Rot*' canker which has attacked recently the variety '*Lord Derby*' with such virulence. Through the very thorough work of Mr. H. WORMALD, my assistant at Wye College, we know now that a particular strain of the "*Brown Rot*" fungus (*Monilia cinerea*) is responsible for the blossom wilt and canker of '*Lord Derby*' and of a few other varieties of apples. Cutting off the wilted blossom spurs as soon as attacked, and cutting

out the cankers *before the tree flowers*, if thoroughly done, leaves the tree healthy again, and is a practicable way of dealing with this very destructive disease. By adopting this measure, owners of young Derby trees can most certainly keep the disease under at slight cost ; where old trees have been attacked for several seasons and nothing has been done, then top-grafting has probably to be recommended.

Among insect diseases, the following instances have been given me by Prof. F. V. THEOBALD.

Certain caterpillars can be dealt with in the egg stage. The egg-rings (on the current year's growth) of the Lackey-moth, and the egg-masses of the Vapourer-moth, can be collected by hand.

"Grease-banding" against the Winter-moth is also an important adjunct to spraying.

The grubs of the Pear-midge are destroyed if poultry is kept among the trees.

The Strawberry Ground-beetle can be caught by means of "traps."

4. CONTROL OF DISEASE BY SPRAYING.

Lastly, we have the all-important subject of spraying to consider. Without spraying, the fruit-grower cannot hope to grow clean fruit.

Let us take the insecticides first.

It is encouraging to find that numerous discoveries and improvements have lately been made in the caterpillar washes. The arsenical washes have been improved and are in a fair way to be standardized. New and efficacious powders used in so-called "dry-spraying" have been discovered, and also pyridine.

The combined wash of nicotine and arsenic enables us to kill at the same time caterpillars and apple-sucker, and to some extent green-fly.

Prof. THEOBALD tells me that he believes that much good can be done by spraying *in the autumn* against the apple "green-fly," and that a heavy lime-wash used *late* in the spring is efficacious (through its mechanical action) against apple-sucker and apple-blossom weevil.

With regard to new or improved fungicides, here again the prospect is equally encouraging.

The most powerful fungicides known are those containing copper. Bordeaux mixture still holds its own as the most powerful fungicide against such diseases as apple-scab. Personally, I favour the mixture made with an excess of lime. I have seen the best results obtained with this, and I notice that the apple-growers of Nova Scotia are now using a Bordeaux mixture with a very great excess of lime, and claim for this mixture (which has been called "Thompson's Bordeaux Mixture") that it does not "scorch" the foliage nor "russet" the fruit as other more neutral Bordeaux mixtures do. Then we have the recently-discovered emulsion of copper sulphate and soap, which is safe for use on foliage. This has been used with good effect on potatoes, but has yet to be tried on fruit.

Against mildews, we have the ammonium polysulphide wash, discovered three years ago at Wye College. This wash, unlike lime-sulphur, leaves no visible deposit on the parts sprayed, and is therefore extremely useful for spraying gooseberries against the American Gooseberry-mildew when the fruit is to be picked soon.

Then we come to lime-sulphur—perhaps the most widely used of all fungicides. I have an interesting announcement to make with regard to this wash. As is well known, when lime-sulphur is used as a summer spray on foliage and fruit, it is very difficult, even when using a nozzle giving the finest “misty” spray, to get the wash distributed evenly over the surface of the sprayed parts; the deposit when dried is found to be “blotchy.” Recent experiments carried out at Wye College show that this difficulty is entirely removed if a small quantity of saponin in solution is added to the lime-sulphur wash. If the lime-sulphur wash contains 0.05 per cent. saponin it will be found that the dried sediment is in the form of a practically continuous film over the sprayed surface. Soap—the usual spreading agent—cannot be added to lime-sulphur for chemical reasons, but by means of the addition of saponin we are able to improve greatly the spreading power of lime-sulphur, which should in consequence prove a better protective wash. Also, by the substitution of a thin film instead of “blotches,” there is much less disfigurement of sprayed fruit.

Another point I should like to mention with regard to lime-sulphur concerns its composition. Our experiments have shown that the fungicidal properties of the ammonium polysulphide wash depend upon the polysulphides present. We are now investigating the action of the polysulphides of the lime-sulphur wash, and it is probable that the strength of lime-sulphur washes will be able to be determined on the basis of the percentage of its polysulphides. This will be a much more scientific basis for standardization than the present specific gravity test.

In concluding, I should like to express my opinion that the prospects of growing clean fruit in this country have never been so good as they are at the present time.

Fifteen years ago—when I joined the staff at Wye College—very little was being done in Kent to control fungus diseases. The cause of “black-spot” or “apple-scab,” of “silver-leaf,” and of “brown-rot,” was quite unknown to the average grower; Bordeaux mixture was unknown except for use on potatoes; lime-sulphur had not been introduced from America; the nozzles in use were those employed for hop-washing and only suitable for the application of coarse sprays. At the present time we find both the farmer and his foreman using magnifying-glass to identify the fungus and insect pests; in several places in Kent we see platforms erected for the making of Bordeaux mixture from “stock solutions”; lime-sulphur is in common use, and many farmers understand the use of the hydrometer in connexion with its dilution; the spraying machines and the nozzles in use are equal to the best made in other countries.

The manufacturers of spray fluids are ready to take up new formulas as these are invented, and are themselves anxious to have the washes standardized on a scientific basis.

There are more scientific workers in the field, and, best of all, the practical man, the fruit-grower—be he farmer, gardener, or nursery-man—shows himself more and more anxious to take advantage of scientific advice and by its help to do his best to grow “more clean fruit.”

In the unavoidable absence of Mr. JAMES UDALE, of the County Experimental Garden, Droitwich, the Secretary of the Society, Rev. W. Wilks, M.A., V.M.H., then read Mr. UDALE's paper on

FRUIT GRADING.

Profitable fruit cultivation entails something more than cultivation only, even when this is of the best. The best varieties must replace the worn-out and out-of-date ones of each kind of fruit grown; and no effort must be spared to produce these superior varieties in the best possible condition.

But cultivation and selection of varieties are not sufficient: something more is required in these days. The fruit must be offered to the buyer in an honest and attractive form. Honest, by the upper layer or layers of fruit being really representative of the bulk; attractive, by judicious grading and careful packing. How is it possible for a prospective buyer to make a *fair* bid for the fruit if all qualities be mixed together, or if the reprehensible system known as “topping” be practised, no matter whether he be buying direct from the grower or through the medium of a salesman or commission agent? Therefore a grower who fails judiciously to grade his fruit before sending it to market is unfair to himself and his fruit, and in my opinion—based upon over thirty years' practical experience—he loses money on the annual fruit crops through this omission.

Unquestionably instances occur when a grower receives a number of sales accounts during a fruit season showing no appreciable difference between his first-grade and second-grade fruit; and the writer thinks he can find examples of this annually in his own books. On October 23, 1917, he sent ‘Cellini’ Apples in first grade and second grade to a salesman, and in return received 18s. per cwt. for the second grade and 16s. per cwt. for the first grade! Or here is an instance of ‘Catillac’ Pears, distinctly first grade and second grade, yet realizing 30s. per cwt. for the first and 28s. for the second.

Again, take ‘Pitmaston Duchess’ Pears, a bush growing in the open and producing 348 lb.; the prices realized in the open market were as follows: First grade, 28s. 9d.; second grade, 24s.; third grade, 20s. At first sight it appeared as though no appreciable advantage had been gained by the grading; but on reflection the thought was strongly borne in on me that if they had *not* been graded at all we would probably have received the third price, 20s., for the whole.

By way of contrast to the foregoing, I take 'Doyenné du Comice' Pear, from two bushes growing in the open, which produced 178 lb. For these the prices realized were 65s. per cwt. for the first grade and 37s. for the second grade.

One more illustration of prices for pears sold in the wholesale market: 'Durondeau,' a bush in the open, bearing 172 lb. These realized 32s. per cwt. for first grade and 20s. for second grade.

All these examples of prices, and any which may follow, were for fruit grown in 1917, the year of plenty, on the one hand, and of low prices on the other; and examples are taken from that year for those reasons. An example of apples for the same year is 'Worcester Pearmain.' Of these there was an abundant crop of good fruit. The first grade realized 27s. per cwt., the second grade, 23s. 6d.

Another example of pears is that of 'Doyenné Boussoch,' which shows a material difference between the return for the first grade and second grade. The fruit was from bush trees growing in the open, and the prices realized were 22s. per cwt. for the first grade and 13s. 1d. for the second grade.

'Annie Elizabeth' apple, grown in 1917 and sold April 12, 1918, realized for first grade, 95s. per cwt., and second grade 67s. Apple 'Schoolmaster,' grown in 1917 and sold on December 5, realized 22s. per cwt. for first grade and 11s. for second grade.

With the foregoing examples, and notwithstanding some disappointments, there can be very little doubt that it pays to grade fruit of nearly all kinds.

Many growers decline to grade their plums, and send them to market as they are gathered from the trees. In the case of common varieties there is frequently some justification for this; but occasionally there are distinctly better samples among the bulk which merit special treatment and which pay for the trouble. Choice-flavoured varieties and varieties striking to the eye for their great size should unquestionably be graded; and though the salesman may not *always* appreciate the distinction, he does so in many instances. But the consumers are not always infallible or discreet when making their purchases of fruit, and will frequently prefer the huge, flavourless, coarse 'Belle de Louvain' to a 'Purple Gage,' 'Coe's Golden Drop,' 'Old Green Gage,' or 'Jefferson.'

Currants, black, red, and white, are always worth grading; but how frequently is an otherwise good sample spoiled by the presence of a few small, ill-coloured, or almost dry fruit!

Raspberries also should be graded when necessary; but in this case grading is reduced to a minimum or rendered unnecessary if the varieties be sent to market in separate packages. For example, 'Bath's Perfection' should not be mixed with 'Superlative' or 'Hornet' or 'Norwich Wonder.' 'Prince of Wales'—old and forgotten though it be—is a prolific, good-flavoured, and good-looking raspberry, deserving to have its own basket.

Loganberries should not escape the attention of the grader. The

handsomest fruits merit separation from the less attractive, and will compensate the grower.

Ripe gooseberries, like raspberries, should be gathered and sent to market in their respective variety: 'Keepsake,' 'Lancashire Lad,' 'Crown Bob,' 'Early Kent,' 'Warrington,' 'Red Champagne,' 'Early Sulphur,' 'Whitesmith,' 'Whinham's Industry,' each by itself, commencing with 'Keepsake' and 'Early Kent' as green gooseberries. Small berries should be picked out and sold separately.

Apricots, nectarines, and peaches should be graded. What is there attractive in a tray of ungraded peaches or nectarines? The small fruits appear smaller than they really are; the larger fruits appear to be larger than they are, and the whole present an appearance less attractive than it should be. If possible, pack first, second, and third sizes by themselves in packages presenting no disadvantages; and if thereby their size is neither increased nor diminished, the small ones are not made to appear smaller by contrast with large fruits.

The matter of *contrast* in size applies with equal force to apples and pears and other fruits.

PEARS.

The pear has probably received more attention in the matter of grading than any other fruit, unless it be the strawberry, which has been graded by nearly all growers for many years.

Pears, unlike nearly all other hardy fruit, may be divided into three groups: those grown upon walls, on bushes, and trained trees in the garden, whether open or enclosed, and those grown in grass orchards. But the fruit from each group should receive consideration in the matter of grading. The finest pears are generally obtained from walls, and, if thinning and mulching have been practised, the majority of the finest pears will be of the first grade, the remainder will probably be good second grade. The same remark applies to the smaller varieties grown on walls, but these are seldom grown for sale, but for home consumption. Pears grown in the open, on bushes or on cordons, also produce many fruits of first and second grades, especially if they have been fed and thinned.

Sometimes, and in certain counties favourable for pears, a number of very beautiful fruits are produced in grass orchards, and these unquestionably deserve to be graded as firsts and seconds; the remainder generally being of third and fourth grades, with sometimes a fifth for the boy customers of the third- and fourth-rate fruit shops. Pears such as 'Doyenné du Comice,' 'Pitmaston Duchess,' 'Beurré d'Amanlis,' 'Marie Louise,' 'Louise Bonne of Jersey,' 'Durondeau,' 'Clapp's Favourite,' 'Chaumontel,' 'Marie Louise d'Uccle,' 'Glou Morceau,' 'Maréchal de Cour,' &c., when grown on walls produce fruit of the first and second quality when they have been duly thinned. Garden bushes and trees trained as cordons and espaliers in the open give a fair percentage of first grade, a large percentage of second grade,

and the remainder thirds. Orchard fruit is not expected to be so generally fine, yet good examples of the just mentioned varieties, and others such as 'Vicar of Winkfield,' 'Williams' Bon Chrétien,' 'Autumn Bergamot,' 'Beurré Clairgeau,' 'Jargonelle,' 'Bishop's Thumb,' 'Uvedale's St. Germain,' and 'Catillac' (the two last named being stewing pears) are often produced in orchards, and may properly be graded into about 25 per cent. first grade, 25-30 per cent. second grade, and the remainder third and fourth grades.

Cherries should receive attention in grading. Fine samples should be separated from those which are second and third grades, and the second being separated from the third. The colours white, red, and black should, of course, be kept distinct.

APPLES.

Although the grading of Apples, as well as of other fruits, has long been practised by a few of the advanced cultivators, yet the system has only been widely extended in comparatively recent years, and it still is not in universal practice unless we take the Order of 1918 as having established it in this country. Grading is, I believe, an interesting, instructive, and profitable operation, because by its means, the grower discovers the true quality of his crops of fruit annually, if he keep correct records of the weight, grade, and value received.

Whether the grading be better done by the use of rings of various sizes, or by weighing, is a matter deserving careful consideration, especially where many tons of apples have to be handled, and to test every fruit by means of a ring would be a serious matter.

In August 1914 I saw an apple-grading machine in operation on the premises of the Eardiston Farming Company, Tenbury, and it required five or six men and women to feed it with ungraded apples and to take away and pack the graded fruit. In the not very distant future, perhaps, depôts will be established in apple-growing districts for grading the apples by machinery at a comparatively small charge for the convenience of those who have little time and labour for grading.

Dessert Apples collectively are medium in size when compared with culinary apples; and a really large dessert apple is not desirable. Consequently true dessert apples should not be too large to pass through a three-inch ring; but if they are too large they may be classed as special grade. If they pass through a 3-inch, but not through a 2½-inch ring, they may be classed as first grade. If through a 2½-inch ring, but not through a 2-inch ring, they will be second grade. Those which pass through a 2-inch ring may be classed as third grade. But these rules are rather arbitrary, because they would condemn nearly all 'Keddeston Pippins' to the third grade, and a large proportion of 'Cox's Orange' to the second grade, and 'Irish Peach' would fare no better.

Culinary Apples have a wide range in size, from the soft-fleshed

'Peasgood's Nonsuch' and the firm-fleshed 'Bramley' down to the 'Easter Pippin' (French Crab) and 'Old Northern Greening.' Consequently there are a number of varieties which naturally under fair conditions produce a fair proportion of fruits of special grade and a very large percentage of first grade, the remainder being mainly second grade, accompanied by a few only of third grade. Of this type of apple there are 'Annie Elizabeth,' 'Beauty of Kent,' 'Alfriston,' 'Bismarck,' 'Blenheim,' 'Bramley,' 'Charles Ross,' 'Ecklinville,' 'Encore,' 'Emperor Alexander,' 'Gloria Mundi,' 'Grenadier,' 'Hambling's,' 'Lady Henniker,' 'Loddington,' 'Lord Derby,' 'Lord Grosvenor,' 'Mère de Ménage,' 'W. Wilks,' and 'Warner's King.' Other culinary apples may mainly be classed as first grade when good of their variety, the next size may be second grade, and the remainder third grade. But there is a group which is smaller than the group just mentioned; and as many of them are not likely to be profitable to grow, I refrain from naming them, because many old varieties must be discarded and replaced by better. This reminds me of an opinion expressed by the late Mr. John Wright many years ago, to the effect that small kitchen apples were too expensive either to grow or to buy, because when they were peeled and cored there was very little left of the apple.

In conclusion, may I offer one word of advice and encouragement to those who have not yet begun to grade their fruit before offering it for sale? I would say to them—Try it, and if disappointed, try again. And again, try, if again disappointed. And if disappointment again comes, and you are *sure* the failure is not your own fault—try another salesman or another market. Send first-class fruit to a first-class market.

The CHAIRMAN then announced that the meeting was open for a general discussion. If anybody wished to emphasize any of the points raised they could do so, or, if they disagreed with the views of any of the speakers, he should be pleased to hear what they had to say, because disagreement often led to more light being thrown on a subject.

Mr. JONES: I should like to ask Professor SALMON if there is any effective remedy for American mildew on the gooseberry, and secondly if he has recognized the Portugal Laurel as a host for 'silver leaf.'

Professor SALMON: American gooseberry mildew can be kept off the fruit by the employment of washes. The lime-sulphur wash at summer strength can be put on as a preventive before the mildew comes, and can be continued for a fortnight or three weeks with safety, until it interferes with the marketing. Then I should ask you to try the ammonium polysulphide, which leaves no deposit, and will keep your dessert varieties free from mildew. After the fruit has been picked you can give the bushes a lime-sulphur spray. Give them a good spraying and then leave them. Then as early as possible in the autumn start tipping the diseased shoots. It will not interfere

with the future growth if you are careful, but you must get rid of as much of the disease as you can. If you leave any disease on the bush be sure and spray early with the lime-sulphur wash in order to stop the appearance of the mildew in the spring.

With regard to 'silver leaf' and Portugal Laurel: this tree is attacked, and also the Laburnum, but the fungus does not produce its fruit upon the trees until they are dead. As soon as you find it on a tree it is a sure sign that the tree is dead, and you can do away with it and burn it.

Captain WELLINGTON, of the Food Production Department, said :— I think there are one or two points which require emphasis. The first point is with regard to distribution. I think the speaker overlooked one point, and I differ from him in his statement that you cannot do away with the middleman. In some cases there is a superfluous middleman, and it is the duty of the grower and the salesman to look into this matter. It sometimes happens in the London market that a lot of fruit is sent by a provincial buyer to a provincial salesman, and then to the retailer. The grower should send direct to the provincial market, and the only way that can be done is by a better system of telephones. Until we get that I am afraid there will be no change in the present conditions. I think it is a matter of great importance that we should have better telephone facilities. They already exist in the west of England, and in that part of the country all fruit is sold direct on the provincial market.

I was delighted to hear Mr. SMITH's remarks in regard to varieties. At the Board of Agriculture we are trying to persuade people to cut down the number of varieties as low as possible. You should plant as few varieties as possible, because we must get bulk of standard varieties, and until we get that bulk we shall not have a really sound British fruit industry.

At the present time 'silver leaf' is becoming a serious factor in regard to the 'Victoria' Plum, but the 'Persnore' is highly resistant to the disease, and I think it will have to be more generally grown until we succeed in growing other varieties which are resistant.

With regard to the breeding of new varieties of apples, I think at the present time we are years behind the times. In fact, we have not made much advance since Mr. KNIGHT was President of the R.H.S. a hundred years ago. We have had few really good new varieties during the last fifteen or twenty years, and we need new varieties possessing qualities commending them to the consumer and grower, and resistant to disease.

In regard to spraying, you often find people spraying with insecticides too late, whereas it should be done early in the season when the buds are just beginning to break. Early spraying gives success, whereas late spraying means failure, because you cannot get at the root of the evil. If you spray early for caterpillar, you do your work effectively, whereas if you do it now, it is only half-done, with the result that you only get a partial crop.

In regard to grading, Mr. UDALE said the fruit-grower had to adjust himself to circumstances, but we shall not get a British fruit industry until we get some system of grading, both in regard to size and also in regard to quality. What we really want is quality, and the Board of Agriculture are anxious that when any new planting takes place you should get the right variety. You must get rid of varieties which are more or less worthless and replace them by varieties of known value. Orchards should be designed with a view to obtaining quality; and we must get quality, otherwise our industry will go by the board.

A Member: I think that improper planting has a great deal to do with the large amount of disease which exists at the present day. Care should be taken that the trees are planted on the proper soil for the fruit to grow in, but I have often found trees planted in improper soil. I have planted perhaps a hundred trees, principally 'Cox's,' with the result that I get a great deal of fruit; but I am careful about the soil, and plant them four yards apart. All my trees look healthy, and do not want spraying. I think that proper planting will eliminate a good deal of the pests.

Mr. SMITH: I think bad planting has a great deal to do with it. You will find trees which will canker very freely in some positions, but if they are turned out and replanted in a more sheltered place they will keep perfectly clear. 'Cox's Orange Pippin' will do well in one place, but in another it will do badly. I have even known them to go for ten or twelve years, and then do badly.

The Member: I have had them growing ten or fifteen years, and have never had any trouble with them. •

Mr. SMITH: You have evidently been very careful with them. I think there is more money lost in growing 'Cox's' than anything else.

A Member: Can you tell us the best varieties to plant together so as to ensure proper pollination?

Mr. CHITTENDEN: As far as I can tell from experiments carried out at Wisley, the only really important thing to do is to plant near one another those varieties which flower together. It does not make much difference what varieties they are, so long as they flower together.

Mr. CHART: I should like to endorse what has been said as to the importance of fruit-growing in this country. There is a point, however, I should like to bring forward, and which I hope the Chamber will take up. That is the question of compulsory spraying. I have been appointed to the Wilts County Education Committee, and in the course of my duties have come across a lot of old orchards which are often the cause of difficulties. Many of these old orchards are infested with insect and fungus pests, with the result that they distribute the disease to other orchards. I have been able to do good by using a little gentle persuasion; but in my opinion the time has now come when the Chamber of Horticulture and the R.H.S. should do something to bring about enforced spraying, otherwise I do not

know how we can deal with these old orchards. I think it is done in Canada, Australia, and the United States, but in this country people will not grub them up although they know the trees are not worth retaining.

A lady: With regard to old orchards, I think it would inflict a serious hardship on people if they had to grub them up, unless the Government compensated the grower. These old trees ought perhaps to be grubbed up, but if a man clears his ground he will suffer grievous loss. A man might have an orchard with trees which had been standing perhaps for forty or fifty years, and you could not expect him to cut them down in order to make room for clean youngsters. He might be deriving a fair income from his old trees, but if he planted young ones he would derive very little income for several years.

Th CHAIRMAN: I think it is too big a question to suggest that the State should provide the capital to replant an old orchard. If you do that, another man would ask the State to provide him with a new orchard. I think the last speaker rather misunderstood the point. The trouble was not so much with the old trees, but with some of the old orchards which were infested with insect and fungus pests. I do not think we can suggest that the State should compensate a man for cutting down old trees, especially when we consider that at the present time the State are out for collecting money and not for distributing it.

A Member: I was at a meeting at Croydon last week, when we sent a letter to the Croydon Corporation recommending that in any town-planning schemes consideration should be given to the planting of fruit trees and fruit bushes. I think this should be done in all town-planning schemes.

The CHAIRMAN: It is a very good suggestion.

Mrs. ARTHUR WEBB: I think, too, fruit-growing should be encouraged on railway embankments, as it is in Holland. In Holland the authorities lease the land to various growers, who plant fruit trees along the railway embankments and round the reservoirs, with the result that it is quite a profitable industry. There are immense areas of land in England along the railway embankments. It may be news to some of you, but the Underground Railway are leasing certain small orchards to their employees for one shilling a year. I think they get sufficient land to grow twenty trees for two shillings a year. If the Underground Railway can do that, why cannot the great corporations like the Great Western Railway and the London and North-Western Railway?

The CHAIRMAN: I think we have had a very profitable discussion. It seems to me, in summarizing the various speakers, that the best thing to do is to select the right varieties which will grow in a particular district. It is no use having a variety which does best in a neighbouring district, but you must plant the variety which will grow well in your own district. Then you must grow those varieties which are best suited for your purpose. If you have one hundred trees do

not grow twenty varieties, but if possible only two varieties. If you have a thousand trees, only grow two varieties, because it will help you in grading, marketing, and in every other respect. When you have a fruit crop, do not stand under the tree and shake it, and run away with the idea that those which drop off are ripe, and those which will not drop off must be shaken off in a week's time. Half the complaints from growers are caused by the fact that their fruit is put on the market in a badly graded condition, and of very poor quality.

With regard to distribution, when there is a glut of fruit in one area, means should be available for distributing it over the whole of the country. If you have a glut of 'Persnore' plums, you should be able to distribute them in Glasgow, Bristol, and the south of England. If we had a proper telephone system whereby the grower could be put in daily touch with the markets, it would save a lot of fruit from being wasted. By a proper system of telephonic communication we could at once ascertain where the fruit was wanted, and it would then be possible to give a proper return to the grower, and would induce him to increase the area under cultivation. Then again the public would get good fruit at the right price. If the public could obtain that, it would increase the public demand for fruit, and those two things together will bring us to the point that we shall have a national fruit industry. It also brings us to the point that we are now paying enormous sums every year to the foreigner for sending us fruit which we should produce at home. If we can bring these various suggestions about, we shall be able to circulate our money inside the country, for the benefit of our own people, and not for the benefit of the foreigner, and this is a question which we shall have to keep constantly before us during the next few years.

Mr. MORGAN VEITCH : I have been asked to propose a vote of thanks to our Chairman, but before doing so I should like, on behalf of the R.H.S. and the Chamber of Horticulture, to thank you very sincerely for the excellent attendance you have given us, and for the close attention with which you have followed the speakers. A few years ago we had a good deal of apathy at these meetings, and people looked bored with the speeches, but this afternoon there has been nothing of the kind. I have noticed how earnestly you have followed each speaker, whether on the platform or amongst the audience, and I am sure we are grateful to you for having taken part in the discussion this afternoon. It is really a joint-conference of the R.H.S. and the Chamber, which, as you know, looks after the financial interests of professional growers. I am sure you will join with me in thanking the speakers for devoting their valuable time in laying before us so many practical points. Their time is extremely valuable; they have devoted time not only to their speeches, but they have focussed long years of study into short speeches this afternoon. I think we ought to congratulate ourselves in having as our Chairman Mr. GEORGE MONRO who has rendered great services to the State for the past five years—in connexion with the Food Production Department, the

Board of Agriculture, and the Special Constabulary, and the immense amount of work he has done for the Chamber of Horticulture.

With these few words I will now ask you to pass a hearty vote of thanks to all the speakers and the Chairman.

The motion was put to the meeting and carried unanimously.

The CHAIRMAN: I thank you very much, and I can only express the hope that a good many more similar meetings will be held by the two Societies, because I am sure it will greatly benefit the members of both.

BOTANY.

By EDWARD WHITE.

[Read March 25, 1919; Sir ALBERT K. ROLLIT, LL.D., in the Chair.]

MOST people are willing to pay lip service to botany as an interesting subject, but the true relation which the science bears to the daily life of man is appreciated by comparatively few. We are a practical people, and there is a popular impression that botany is a science of small practical importance, offering as its best reward the discovery of obscure plants in field, hedge, or woodland. Even many, who know that botany represents the scientific foundation upon which this Society stands, imagine that its chief aims are the classification of plants and the production of new forms of beauty in flower and foliage. Most dealers in every-day commodities would smile at the suggestion that botany could be employed in any way to influence their business to advantage.

A wider conception of botany was suggested when I was asked by a company, interested in the exploitation of a large tropical area, to introduce a man of first-class ability and expert in economic botany—*i.e.* he was required to identify plants of proved commercial value, to estimate the possibilities of new discoveries, to act as physician to cultivated crops, and also as botanical consultant in all matters connected with agriculture, horticulture, and forestry.

The appointment had interesting possibilities, and I was sorry I could not find among my friends anyone qualified to fill it. The manager of the company said he expected they would have to get hold of someone, whom he vaguely called a "foreigner," after the War.

Shortly afterwards, I was asking about the work of a certain boy, and I was told that he alone in a school of 400 pupils was taking up the subject of botany. I should have been less surprised if I had known then how very little the study of botany was practised at public schools generally. Plenty of first-class reasons can doubtless be given for the omission, but there seems to be a certain connexion between this fact and the difficulty of finding a man for the appointment referred to. This view is supported by the prospectus of the University College in one of the most important business towns of England, which I saw by chance only this week. Among about twenty-five subjects of science and art, for the study of which provision was advertised, botany was conspicuously absent.

You may notice, moreover, that, as reported in the public speeches of authorities concerned with the promotion of science, the word botany is very rarely mentioned.

When I asked the Royal Horticultural Society whether it might not be desirable to stimulate further the study of economic botany, I was invited to read a paper on the subject. I did not bargain for such an answer, but the matter seems to me so important that I presume to call attention to a few points which, however elementary to the few experts who have been trying for some time to enlighten public opinion on the matter, may give a fresh idea of the possibilities of botany to some who have not thought about the subject.

British science suffers from the chief defect of the old "Contemptible Army." The personnel is too small for the needs of the great Empire. Little help is received from laymen, for a wide gulf stands between the average Englishman and the scientific expert—the former recalls, perhaps, the superior attitude which boys are too often taught at school to adopt towards the "modern" men. He is as reticent in referring to science as in speaking a foreign language. Formerly, he preferred to let the other man speak English; nor did he worry if Germans filled important scientific appointments of this country. Unfortunately, even the lessons of the War have not taught some people the value of science and the importance of finding out the best means to a given end. It has been suggested in more than one responsible newspaper that British character has beaten German science in the great War: the fact being, I believe, that British character was losing the War until British science was called in aid.

In the war of industry also, which looms ahead, business capacity will have to be supplemented by superlative efficiency if we are to hold our own. Not every man can nor need be what we call a scientist, but it can and should be part of the education of every child in this country to be taught precisely what science means and why it is imperative to maintain under favourable circumstances our quota of investigators in every branch of knowledge.

Not many of us are anxious to converse with Germans, in any language, at present; and there are loud demands in many quarters for their future exclusion from British scientific appointments. This will be as it will; but it is worth noting that the Revolutionary German Government has decreed that henceforth science will be taught in schools without charge; so, certainly, there will be in the future more Germans than ever capable of filling such posts in other countries, if not in our own.

To the shoemaker there is nothing like leather, and those who are interested in British Horticulture must encourage high efficiency of the parent science of botany. Especially important is economic botany, which is charged with the study of plants in respect of their use to man.

The vegetable kingdom is probably the greatest on earth, judged by the number of living subjects. The expression, "Vegetable Kingdom," recalls that game of one's youth, which hardly suggested the true proportion of objects originating in plant life. There is little in

the appearance of linen, sugar, or rubber, for instance, to remind one of their vegetable origin. But when we remember that food, fuel, clothing, building material, furniture, oils, paper, medicines, rubber, and hosts of other essential materials, are derived from plants, we get a hint of the breadth and universality of the vegetable kingdom. Without plant-life, man, as we know him, would not be.

The raw material required for the purposes mentioned is built up by chemical action and stored in one part or another of a plant. Plants are therefore so many laboratories engaged in the manufacture of all kinds of chemical bodies which man is slowly learning to convert to their best use. Through successive centuries these discoveries have been made—first by accident, then by experience, and finally by intelligent investigation. The dearest ambition of botanists is to penetrate into the inner recesses of these laboratories of Nature, to discover there her secret processes and to employ her forces to carry out their own designs. The labour of Nature is the cheapest in the world, and correctly handled she does not go on strike.

Primitive man must have wandered like an animal, relying upon Nature to supply his appetite for vegetable food and other necessities of life.

Necessity and instinct taught him to protect and eventually to cultivate those plants which best satisfied his needs. Judging by our own conservatism to-day in the matter of food, one would imagine that when a plant was once found that was nourishing and easily grown, little heed would be given to the cultivation of other plants. Interchange took place among neighbours, and introductions were made by conquerors, so that in process of time a considerable number of nourishing plants have been evolved. We know, however, that the number of plants cultivated for food is very insignificant compared with the many still capable of important development. There is still an immense field for experiment in this respect.

In many large areas throughout the world the great reserves of the vegetable kingdom still await investigation with all their possibilities of improvement and development.

Under cultivation many kinds of plants have appreciated out of all resemblance to their original form. Most cultivated plants are recognizable in a much more elementary form.

The necessity for adaptation to new conditions of climate and soil has effected remarkable modifications in some instances, and striking transformations have resulted from cross-breeding between plants of the same family. In the prosecution of such experiments the future holds equally interesting promise.

Many valuable varieties of plants have been produced by haphazard hybridization. Small insects have been responsible for many such productions, whether new flowers of much beauty, fruit of improved flavour, trees of exceptional size or quickness of growth, or varieties of edible plants capable of resisting disease and drought. The latent qualities in plants which a casual insect may unlock have

proved so surprising that one dare not put a limit to the possibilities which may be behind the experiments of intelligent men working with definite purpose.

Valuable experimental and practical work has been done in this direction in this country, but it has been generally confined to familiar edible plants, vegetables, and fruits, and to the improvement of flowers and foliage in ornamental plants. There are many other directions in which experiment and research has given and can give further important industrial results. The chief method of emphasizing a desirable quality in a plant is to select parents which most nearly approach the conditions aimed at, and from the issue of this fertilization to select and cross again and again those individuals which show improvement in the required direction.

When the principle is granted that it is possible to accentuate special qualities in plants with considerable certainty, there need be no reasonable limit to the ambitions to which imagination may aspire in their improvement when controlled by knowledge and patience. This applies not only to food plants, but to other plants whose chemical properties make them valuable for specific industrial purposes. It is important to realize that research operations of this nature are necessarily slow and unspectacular, even if the eventual results may appear miraculous.

It has been pointed out by Sir E. RAY LANKESTER that, in spite of the great accumulation of knowledge concerning plants cultivated by man, complications and contradictions are continually arising both in the study of established plants and in the growth of new varieties. Finality is never assured, and the work of the botanist can scarcely ever be said to be completed in any one case. From time to time new plants are found which make a back number of apparently staple industries. Chemists have learned to make from the refuse of coal and wood many compounds which were formerly at greater expense and with less certainty obtained from plants. Consumers get new ideas, preferences, and fancies. Improved transport opens new sources of supply. Many circumstances are liable to unsettle established methods of manufacture or business based upon plant production, and there is constant need for the protective anticipation of economic botanists in every country.

The immense material waste caused by four and a half years of war will have to be made good in a large measure by the chemical activity of plants. This must necessarily be a slow business, and everywhere is a cry for greater productivity. It is conceivable that a few happy discoveries by botanists might have important consequences in reducing the losses of the War. So much of the raw material required for our industrial purposes is grown out of the country, that the extent of the waste is not very evident to us, the most noticeable indication being the destruction of woodland. Some misleading deductions might be drawn from the new activity in food production by small cultivators and allotment-holders. But useful though this

work has been, and much greater though it may be, their total productions have counted for little in the aggregate of food requirements of the country. The consequences, however, of turning the thoughts of such a large number of intelligent people to consideration of the products of the soil may be very important. The fact is emphasized that there is plenty of plain, straightforward work for the botanist to do here before imagination need open up new fields of discovery.

Every gardener is familiar with the cry for the best variety of every sort of plant, and nurserymen and seedsmen are always trying to turn out something better than the last. Most of the problems involved in scientific husbandry turn upon the variety of the plant grown—for the plant is the thing. Such problems include inquiry as to the variety of the finest flavour and bulk, or the variety which contains in the most concentrated and accessible form the special property which makes it valuable—the one which can be most cheaply cultivated as regards labour and manures, and the one which exhausts the soil least; which is the best resistant to certain diseases or drought, and incidentally the one which offers most useful by-products. The evolution of the ideal plant for a given purpose is work for the botanist, and this task alone offers sufficient justification for his existence. The wholesale purchaser, or manufacturer, who uses raw material, employs the most expert buyers he can get, and in many cases the analyses of practical chemists are needed in order to test how nearly its qualities approach what is looked for in the ideal product. The grower needs the assistance of botanists, to stand towards him in the same relation as the chemist to the manufacturer; and between the chemist and the botanist there should be constant co-operation. The services of the botanist would ultimately be as advantageous to the manufacturer as to the grower.

It would be invaluable to the cultivator of small holdings to have reliable assistance in respect of the maximum possibilities of his land, especially if, as is possible, entirely new plants of economic value could be introduced.

During the bad years of farming in the last century, cultivators often had to plant crops knowing they were bound to lose money on them. They often chose those on which they stood to lose least for the moment, although by so doing they reduced the value of future crops. Botanical research and experiment would be an important insurance against the recurrence of such disastrous days.

The supply of food for future generations is likely to be an increasing problem. The man in the street says airily: "Oh, science will look after that!" without realizing that the opportunities of science in this country depend upon the encouragement he affords.

There are many large wasted areas in this country with soil far more fertile than that which in other countries has been improved into valuable agricultural land. There are also enormous tracts of land throughout the world which have more excuse for contributing nothing to the world's larder—rocky mountain-sides, sandy wastes,

water-logged flats, and dense thicket growths. The enlistment of a considerable proportion of these wasted areas to do their share in the world's economy may eventually be absolutely necessary to the human race. Encouragement is given to the possibility of finding plants of industrial value suited to these areas by the fact that many of them already maintain vegetation of a sort which may provide the basis of evolution.

Many unpromising areas have already been brought into use by the discovery of particular plants which grow under existing conditions or by the introduction of plants which flourish when freed from the strangling competition of other plants on more fertile soil.

We are familiar with the bleak downs in Sussex, where on two or three inches of soil, in which nothing else of value does much good, the shallow-rooting sheep's-fescue makes possible a famous industry in sheep-breeding. Similar cases occur elsewhere in Great Britain. Then there are expanses by the sea-side, where barren wastes of loose sand are raised several feet high by one wind and laid flat by another. These areas are being fixed and made stable by the aid of the valuable marram-grass, and the land is consequently rendered suitable for the growth of trees. A good object-lesson is found in the cultivation of alfalfa (better known to us as lucerne).

In the United States alfalfa is an imported plant, and even ten years ago the value of the hay it produced was put at twenty-five million pounds. It is described in an official report as the great forage-plant and soil-renovator of a vast area in the Rocky Mountains. It is specially suited to arid regions subject to drought, and of particular value as a rotation leguminous crop, and because its growth greatly increases the productivity of sterile soil. Varieties have been introduced into America from oases in the Sahara, types from Turkestan resistant to drought, others from Siberia resistant to cold, sand-lucerne from North Europe, and other varieties from Arabia, Peru, and Chile.

The Americans are extremely anxious to develop the possibilities of the sterile areas in their country, and set great store by this plant as a fertilizing agent.

Such miracles in the matter of adaptation to soil and climate have already been effected, and such unsuspected qualities have been developed in plants, that it is impossible to say what latent powers may still await revelation by calculated experiment. The freakish powers of Nature are bestowed impartially upon the plant and animal worlds, and it is not to be supposed that they were exhausted when Nature first uplifted the palm beyond the reach of browsing animals, and then drew up the long neck of the giraffe in pursuit; or when she invented the hump of the camel, the larder of the so-called ship of the desert; or designed the marvellously sure foot and mathematical eye of the chamois.

Another war, such as we have just experienced, would leave the world perilously short of timber. In this direction a magnificent

field for research is open to botanists not only on the recognized lines of scientific forestry, but in the direction of speeding-up Nature and improving by hybridization points which give special value to timber—such as grain-markings, strength with lightness, &c.

At present it takes the lifetime of a man to get many kinds of trees matured for ordinary timber purposes. Of what immense value it would be if the period of growth and development could be appreciably shortened. The growth of trees for timber in bulk is a different matter from the cultivation of those which supply valuable chemical products—such as sugar, resin, camphor, rubber, and so forth. The latter involve a new set of problems and the special co-operation of chemists.

Botany abounds in questions which scientists hesitate to answer. Among these problems none needs more complete and continued investigation than the subject of the diseases of plants. Finality can no more be achieved in this matter than in the case of the ailments of mankind.

We think casually of the soil as so much inert or dead material, whereas in reality it swarms with myriads of organisms as keenly anxious to live at the expense of other life as man himself. Some of these minute organisms are necessary to the existence of more advanced plants, while others are parasitic and deadly. It is the aim of one branch of botany to identify them respectively, to work out their life histories and deal with them faithfully according to their deserts.

Plant life is more or less the prey of all life, and in many respects a passive victim.

We are able to protect effectively the plants we cultivate from the attack of their larger enemies, but the smaller fry, especially those of fungus growth which we call disease, are more subtle and more difficult to deal with.

Many plants have learned to defend themselves from enemies of long standing by special development in height or shape, toughness of bark and leaves, ferocious thorns, subtle poisons, disagreeable odours, and various other devices. Against fungus diseases, however, their natural defences are often weakened owing to adverse conditions of the atmosphere and soil. Possibly, plants sometimes learn to protect themselves from disease by means of adaptation; but the principle of the survival of the fittest applies equally to the enemy organisms, and they too may adapt themselves to new adaptations, until it becomes a case of which can go one better. Meanwhile, the agriculturist is losing his crops. It is for the botanist to keep up to date with the latest moves of elusive enemies, and to give the crop-plant all available assistance in defence against attack. Prevention is better than cure, and the evolution of disease-resisting plants would be more satisfactory than revenge upon a partly victorious enemy. An equally important issue is the discovery of methods of cultivation which enable plants best to resist attack.

The actual loss in wealth by disease and insect enemies of plants is inconceivably great, but certain historic examples stand out in particular.

The destruction of the French vineyards is a well-known example, when the loss amounted to 400 million pounds in twenty years from the ravages of phylloxera. The vine industry was reinstated by the introduction of an American variety, of which the phylloxera does not seriously injure the roots, and the French vines were grafted upon American stocks.

The historic Irish famine was caused by the loss of an entire year's crop of potatoes from the well-known disease.

I have not seen any estimate of the total year's loss to British agriculture; but one who knows says that it is very great, and that practically every crop has its pet enemy.

A third of the crop of hops has been destroyed in a year, with the resultant loss to growers and pickers. It is estimated that the annual loss to American agriculture approaches 100 million pounds; and many other well-known cases of widespread disaster could be quoted to demonstrate the immense importance of the work still awaiting the investigator of plant diseases and insect enemies.

If we glance for a moment at other countries, we note that the world owes a greater debt to China than is generally recognized. For four thousand years an industrious and intelligent race has taken intense interest in the plant industry. These people have known how to develop to perfection their rich native vegetation, many species of which are almost unknown to us. They have provided staple industries to many parts of the world, which are identified with the cultivation of some particular plant. Tea, oranges, peaches, and some of the best plums, for instance, originated in China, and possibly the olive, as well as many industrial plants of the greatest importance.

It would be interesting to know what the Chinese could have made of our native wild fruits, taking, as one example of their work, a thorn-hip, which has been improved into a favourite national fruit as large as a medium-sized plum.

The American Government recognizes that agriculture, and the cultivation of plants for industrial purposes, represents the greatest potential wealth of their country. Since 1905 an extensive examination of the plant resources of China has been undertaken, under Government control, in addition to enterprise elsewhere, with the object of introducing industries which promise success in America. Important plant-testing stations have been established, where tests are made of the possibilities of the plants introduced.

The Germans were determined to make the fullest use of the vegetable wealth of their late colonies, and had subjected them to minute botanical investigation, of which the results were classified and published with reference to the economic possibilities.

The British Empire possesses an immense proportion of the

lands of the earth which are richest in existing plant life and in the possibilities of future development. Many of these areas await full investigation. We and the Dominions are consequently trustees of vegetable wealth, the extent of which cannot be estimated even by experts, and of the value of which most English people have only the vaguest idea. It is a question whether this wealth shall be inadequately utilized until others appropriate it, or whether we ourselves shall make use of the fortune into which we have stumbled.

The answer depends, I believe, on the extent to which the science of economic botany is encouraged by the ordinary business men of this country.

In greatly daring to read a paper on this matter, I have not pretended to speak as a scientific expert. I am concerned only to try to add to the number of those who recognize the value of the work already done by economic botanists in this country and the need for affording them the assistance to which they are entitled.

For, of course, the matter is not neglected by our scientists. There are a few centres of research and education where botanists are keenly alive to the matter and quite abreast with the times. It is they who insist that they are too few for the great tasks which call for their attention and the work which lies ahead. Experiment is needed in every direction, and research can only be carried on by men whose livelihood is assured and for whom appointments are waiting which will be sufficient inducement to take up economic botany as a special branch of science.

I saw, the other day, that the Board of Agriculture was making a large grant for investigation into the science of poultry breeding. This act encourages one to hope that in the course of time the importance of the science of economic botany, of which I have so imperfectly pleaded the cause, may eventually receive adequate recognition.

May I conclude with a dictum of Mr. ARTHUR BALFOUR: "The great advancement of mankind is to be looked for in our ever-increasing knowledge of the secrets of Nature"?

rising more than once so high as 56° . Notwithstanding this, however, vegetation at Wisley remained apparently quite dormant, and so far as could be seen there was no appreciable movement even in Hellebores—a sluggish condition which appears to have been very general in gardens all over the kingdom.

February.—The prevalence of warm southerly winds kept the temperature considerably above the average. These warm winds were due to a series of cyclonic disturbances which passed across

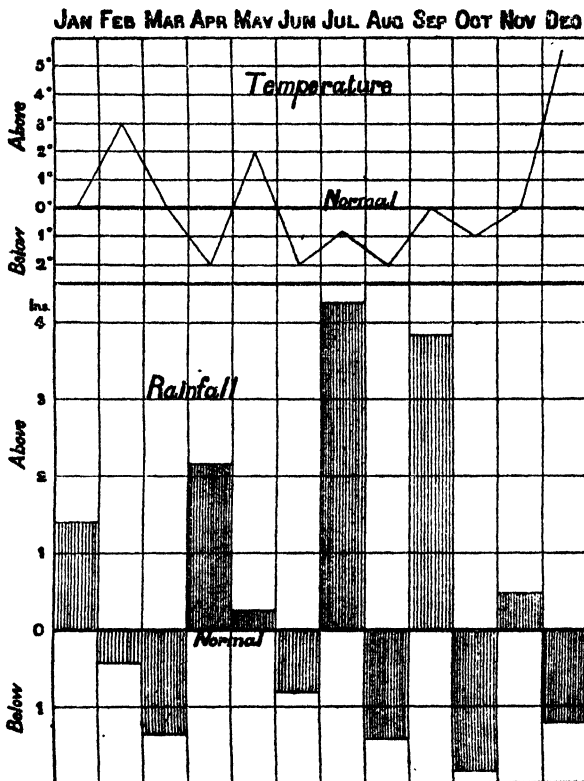


FIG. 7.—DIFFERENCE OF MEAN TEMPERATURE AND OF RAINFALL FOR EACH MONTH FROM THE AVERAGE.

our western coasts, following an easterly track, and bringing with them a current of warm air which spread all over the kingdom. At the Gardens the thermometer rose to nearly 60° in the daytime; whilst at night, owing to terrestrial radiation being checked by cloudy skies, there was but a slight fall, with the result that we had warm nights as well as warm days, and a high temperature for the season all over the kingdom. Both for agricultural and horticultural purposes the weather of the whole month was ideal; and at its close the "Season" was far ahead of what had to be recorded for the corresponding period in the preceding year. In some parts of the kingdom

the rainfall was large, but at Wisley it was only moderate in amount, and came chiefly in the first ten days of the month. In most districts less than the normal amount of bright sunshine was experienced, but at the Gardens the deficiency was not very great, the average daily amount being two and a half hours. As the general result of these favourable climatic conditions all early flowering bulbs, and also trees and shrubs, began to move rapidly, and reports were received from several districts that apples, plums, and cherries were already "looking very promising."

March.—Throughout the greater part of this month the weather was of the quiet type which usually accompanies what are known to meteorologists as "anticyclonic conditions." Occasionally there were strong winds, but they usually occurred in districts of limited area—such as a portion of the south-east coast where they caused some damage in exposed gardens—but they were by no means of general occurrence. It was a decidedly dry month, and a deficiency of rain was experienced over the kingdom generally. Temperature was high for the season, and especially so towards the close of the month, when at some favoured spots the thermometer rose to between 60° and 70° in the shade. With such conditions vegetation made rapid progress everywhere, and the general report from all parts of the country was of satisfactory progress in all garden and farm work, and in growth. At Wisley all early flowering plants made great strides and all arrears in growth were very soon overtaken, and normal conditions established, notwithstanding that as a set-off to the warm days there were many cold nights with frequent frosts of some severity. At Wisley seven degrees of frost was the lowest reading recorded in the screen, four feet above the ground; but on the ground itself the thermometer fully exposed to the effect of radiation—as of course are all plants under normal conditions—registered nineteen degrees below the freezing-point on the night of the 16th.

April was a month of abnormal weather, the winds being persistently northerly and easterly, and the weather in consequence cold, and by no means spring-like, until quite near the close of the month. At Wisley the rainfall was excessive; and in many parts of the south-east of England, with longer records of rainfall than Wisley has as yet, the record of rain was larger than had been recorded in any preceding April. With this, of course, overcast skies were the rule, with a lack of sunshine; and the reports of the weather generally spoke of it as wet and cold, with vegetation in a backward condition, and much retarded by the cold easterly winds. All over the kingdom the temperature was below the normal. Snow and sleet occurred in many districts; and in some places hail fell with sufficient force to do much harm to the budding fruit trees. The wettest districts were the south and east of England, where at several places larger falls of rain were recorded than in any previous April for many years, with much mist and haze, and with very little sunshine.

May.—The cold and inclement weather of April continued into

the first week of May. Then the wind changed from east, which had been its general direction for some time, and became westerly. This was accompanied by a decided increase of temperature and a general improvement in the weather, although it was also attended by severe thunderstorms and heavy local falls of rain and hail. Some of these storms were of exceptional severity, especially those that occurred in the north of England and south of Scotland. In one of them an observer counted forty-five flashes of lightning in one minute ; and as evidence of the severity of the storms generally much damage was reported to have been done to potatoes and other growing crops, whilst in places timber trees were so cut about by hail as to appear defoliated. Damage from the rain, hail, and lightning which accompanied the many storms of this period was more or less severe in places scattered over a very large area ; but this was due entirely to the unwelcome violence of the storms—the rain they brought with them was much needed and very acceptable indeed. But on the whole it was a splendid growing month, with an abundance of sunshine and sufficient rain, and without frosts by night, or nipping winds by day.

June.—The peculiar feature of this month's weather was that, after beginning with a couple of abnormally hot days, there ensued a long spell of cool and altogether unseasonable weather, lasting to within a couple of days of its close, when it wound up with another brief spell of seasonable midsummer warmth. The winds were from a northerly or westerly direction throughout the greater part of the month, keeping the days cool ; whilst with clear skies at night terrestrial radiation was very active, resulting in low night temperatures and much more frequent ground-frosts than are usual or desirable in June. At Wisley the thermometer laid upon the grass, open to the sky, fell to freezing-point on a dozen nights ; and bracken on the adjoining common, and potatoes growing in more than one part of the garden, were " cut " on the night of the 5th ; and still more badly on two occasions later on towards the close of the month ; beans and marrows also suffered at the same time. The month was a dry one, and there was a very liberal amount of sunshine ; but owing to the lack of rain the crops generally suffered from drought, and notwithstanding the sunshine the weather of the month as a whole was cool and unpleasant. The deficiency of rainfall, although general, varied considerably in degree over the kingdom, but everywhere the fall was below the normal amount. At the Gardens it represented only six gallons of water to the square yard, which is little enough for a midsummer month, and especially so since one-third of it fell on a single day—the 14th.

July.—Both the beginning and the end of July were dry and warm, but in the middle three weeks rain fell in greater or less quantity every day, giving a total fall for the month of five and three-quarter inches—the largest fall in any July since the observations have been made at the Gardens, and representing a deposition of over twenty-seven gallons of water to the square yard. The effect of this phenomenal

rainfall upon crops generally was to cause them to make extraordinary progress ; but, on the other hand, the sodden soil of the beds in which seed had been sown became " set " and hard, so that small seeds especially were unable to make their way through, and were spoiled. Crops generally were, however, at the close of the month looking remarkably well, and there was the promise of a good harvest, and in particular of an exceptionally fine yield of wheat. Generally speaking, there was more than the usual amount of sunshine notwithstanding the large rainfall ; but at the Gardens there was no day without some sunshine being recorded and its daily average duration was six and three-quarter hours—this, in the same month as the maximum fall of rain. Another feature of note in the weather was the unusual frequency of thunderstorms, some of them of great severity and accompanied locally by phenomenal falls of rain.

August.—The weather throughout this month was on the whole dry and bright. The rainfall was below the normal amount everywhere, and the only falls of any consequence at Wisley occurred in the first two or three days of the month. Throughout the entire month there was only one entirely sunless day (the 2nd) ; and on the hottest day of the month the temperature in the shade rose to nearly 88°, and this proved to be the highest temperature of the year recorded at the Gardens. There were, however, but few outstanding really hot days, and at night the temperature was not seldom low for the season ; whilst the thermometer laid upon the grass, fully exposed to the sky, once fell to the freezing-point. The winds were from the south-west almost throughout the month.

From reports received from various parts of the kingdom it seems that on the whole the weather of this month was seasonable—good for the ripening and harvesting of crops, and yet providing plenty of grass and aftermath in the meadows. And although this conspectus may not hold good for the entire kingdom, yet the exceptions were limited to small areas widely separated.

September was unusually wet. Indeed, for the district around the Gardens such a wet September had never before been recorded since rainfall observations were begun in 1904. At Wisley the fall approximated closely to six inches, and the soil became thoroughly soaked. Potato disease became very widely and badly developed ; whilst shrubs and trees, and indeed nearly all vegetation, developed an extraordinary amount of leaf-growth. Squalls of wind and rain, and also thunderstorms, were of somewhat frequent occurrence ; and on the 12th there was a furious squall of wind and rain in which the wind velocity rose to fifty-five miles an hour—an unusual velocity for an inland district. As a set-off to the discomforts of such a wet autumn, it is at least comforting to read that " the public health was good," as indeed is not unusual in wet seasons ; but the temperature was below the average for September, and from the horticulturist's point of view the weather of September was by no means ideal.

October.—The weather of this month may be quite fairly described

as dull, damp, and cheerless ; the first portion of it was also very stormy, and in some of the south-westerly gales which were experienced the wind attained considerable strength. The temperature was upon the whole rather below the normal, and occasionally sharp touches of frost were recorded in the screen, whilst upon the ground frosts were both frequent and severe. During the latter part of the month there were many wet fogs, but the total precipitation from Both rain and fog was not very great. In addition to this there was very little sunshine to relieve the general dullness of the month, but as the

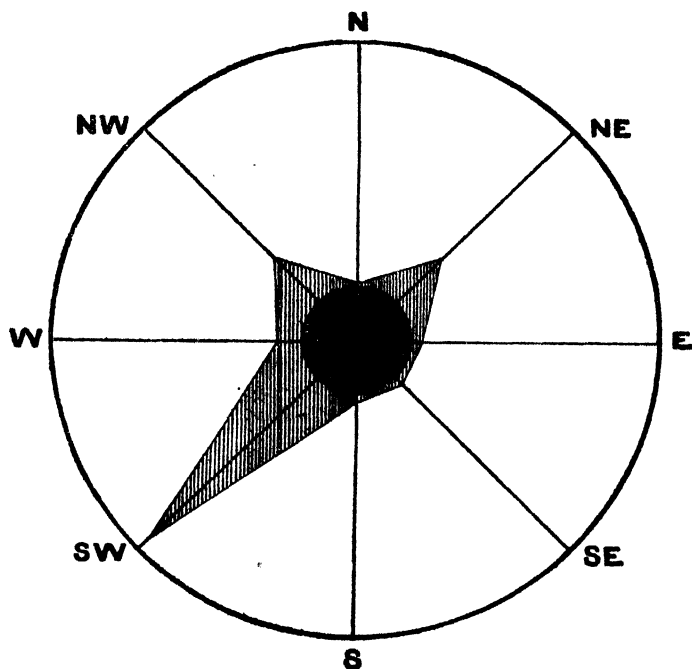


FIG. 8.—ANNUAL DISTRIBUTION OF WINDS ROUND THE COMPASS. THE PREVALENCE OF CALMS IS INDICATED ON THE SAME SCALE BY THE DIAMETER OF THE CENTRAL CIRCLE.

result of a few really bright days, the daily average duration of sunshine at the Gardens amounted to two and a half hours. Over the kingdom generally a good deal of unharvested corn was spoilt by the excessive wet even before it could be cut, and from the same cause the unlifted potato crop also suffered, whilst autumn work on the land was necessarily much delayed. It is, however, worth noting that this was less due to the amount of the rainfall than to its persistency, many observers calling special attention to the fact that although the fall of rain was *less* than the normal amount it was spread over an abnormally large number of days, resulting in weather which can be better described as "damp and dull" than as "rainy." It resulted, however, in much damage being done in some districts to hay and corn—hay-making being still in progress

in the Peak district in the last week of the month, whilst in parts of Essex and Herts strawberries, raspberries, and plums, only just ripened, were gathered. At the Gardens there was a fine display of autumn tints on trees and shrubs, when further growth had ceased owing to the colder weather, and these continued for a longer spell than usual.

November.—In this month there were two distinct spells of unusually mild but unsettled weather, one at the beginning and the other at the close of the month. November is seldom a brilliant month, and this year it was fairly true to type in that respect, being damp, dull, and misty for the greater part; but fairly mild and with quite an average amount of sunshine. The middle of the month was, however, cold and foggy, and occasionally there were some sharp frosts; but snow and other frozen precipitation was only seldom experienced. The winds were again mainly from southerly and westerly points, and winds from a northerly quarter were rarely felt. The only frosts were those that occurred at night, when the thermometer on the ground, fully exposed to the sky and to terrestrial radiation, sometimes fell very low, and sharp ground-frosts were the result. The rainfall of the month was generally less than is usual in November; but in the northern parts of the kingdom, and also in North Wales, some very large downpours were recorded.

December.—The chief features of the weather of this month were its abnormal mildness, combined with much wet weather—conditions which were due to the fact that westerly and south-westerly winds blew with great persistency all through the month, quite dominating the weather all over the United Kingdom. In many districts more or less rain fell on two out of every three days right through the month, and in some parts of the British Isles the aggregate fall far exceeded the normal amount; indeed, in not a few instances daily amounts were reported considerably in excess of any previous maxima on record for the district the station represents. Temperature was in excess of the normal over nearly the whole of the kingdom, and in not a few localities daily maxima were registered higher than any previous maxima of which a record has been preserved for the district. In some districts the mean temperature for the month was quite ten degrees above the normal, and in a few instances maxima were observed in excess of any recorded during the preceding thirty years. As illustrating the general condition of things in the west, an observer on the fringe of Dartmoor reported that, although other Decembers had brought more rain, yet, in his many years' experience, he had never known anything like the ceaseless downpour of the last six weeks of the year. With such a record of rainy weather the small amount of sunshine recorded everywhere was only what might have been expected, and in many parts of the kingdom the deficiency was very marked. As examples of this, some counties in the northern half of England had only ten, seven, and even three hours of sunshine registered in the whole month—amounts which, it need scarcely be observed, are greatly below the average for the month.

DRY ZONE AFFORESTATION AND RECLAMATION OF WASTE LAND.

DELHI AND ITS WORKS.

By A. E. P. GRIESSEN, F.R.H.S.

IN 1902—a decade before the ancient capital of the Moghuls was restored to its pride of place as the coronation gift of the KING EMPEROR—Lord CURZON, then Viceroy and Governor-General of India, invited an expression of opinion on the possibilities of reafforesting the Northern Ridge of Delhi, which, at the time, formed the boundary of the Civil Lines.

There were not wanting indications that the original flora of this historic portion of the ridge had, for strategic reasons, suffered considerably during the Relief of Delhi. Besides, owing to the free exercise of grazing rights, or rather to the limited restrictions against grazing, and the close proximity of the ridge to the city, it was repeatedly depleted by cattle. The presence, however, of a few young trees seemed to suggest that the local authorities had paid some attention to its possible restoration, though no definite scheme had been formulated.

My own special duties in connexion with the preparations for the Great Coronation assemblage left me but little leisure for an inquiry of this nature, but I undertook a general survey of the ridge and ventured to suggest that much could be done by protecting the entire area, and not only allowing Nature to do its work, but supplementing Nature's work with a planting scheme aiming at the utilization of all natural depressions, where vegetable mould had collected, for planting operations. Several pits were then excavated to ascertain the possibilities of the suggestion, and it was found that the idea was practicable. Beyond this, very little was then attempted, as the Durbar works claimed all my time and attention, and after the Durbar the idea was left to the local authorities to develop.

At the same time inquiry was made into the questions of reclaiming the barren land outside the Northern City Wall. The soil was strongly impregnated with salts, and it was evident that little could be done in the absence of an abundant water supply. Failing this, it was suggested that improvement might result by treating the site so as to retain as much of the rainfall as possible, and thereby check the action of the salts, afterwards planting as a park with salt-resisting species.

An experiment on these lines was conducted in the plot bordering the Alipur Road just below the cemetery; and, though the result

was not immediately apparent, the present condition of the site is a very clear evidence of the success of the experiment, and demonstrates how even the most barren wastes may be reclaimed. It is probable that most of the *Thevetia nerifolia* ('Pila Kanar') occurring there were planted in 1902.

In recent years, with the advent of the canal, the land between the Kashmir Gate and Sabzi Mandi has been transformed, thanks entirely to the exertions of the present garden superintendent, Mr. R. N. LOCKE. Where nothing would grow, a wide expanse of turf now covers the saltpetre tract which formerly presented such a desolate appearance, a practical demonstration of the reclamation of brackish land when soft water is available in abundance.

Having again been specially deputed for duty in connexion with matters relating to the Coronation Durbar of 1911, many of the inquiries made on the occasion of the former Coronation assemblage claimed attention and formed the subject of interesting discussions. Subsequent events, which led to His Majesty the KING EMPEROR proclaiming Delhi as the future Capital of India, necessitated the examination of the former suggestions, and though the area selected for the New Capital lies to the south of the present city of Delhi, the Northern Ridge has retained all its former interest.

It formed originally the limits of the old Civil Lines, and it was beyond that ridge that the historical Durbar of 1877 was held, the same site being selected by Lord CURZON for the Coronation assemblage held during his viceroyalty, and again by Lord HARDINGE for the Coronation Durbar of 1911.

In the selection of a site for the New Capital, sentiment favoured the Durbar area, but a close survey of the surroundings soon proved it to be utterly unsuitable for the purpose, and on the southern site of the present Delhi, over the ruins of so many Delhis of the past, the New Capital is rising as a monument to commemorate the benefits of British influence over this vast Empire.

Here again, the New City has its western boundary, the continuation of the Delhi Ridge, known as the Southern Ridge. This natural feature bordering the city on the west forms a most suitable back-ground. Extending in a southerly direction, it dominates the entire surrounding country, but, being devoid of vegetation, it presents a most barren aspect. The idea of afforestation naturally came into prominence and called for the immediate attention of the authorities concerned, the matter assuming concrete form in 1912-13, when a Forest Officer of experience was deputed to frame a scheme. Having also been approached on the subject, I paid a special visit to Delhi and surveyed the site with a view to ascertaining what may have been its original flora.

The remains of the following species which may have formed its original flora were traceable. In the rocky interstice, where nothing would seem to be able to thrive, remnants of *Carissa spinarum*, a dwarf species of 'Karonda,' *Butea frondosa* ('Dhak'), with *Cordia*

mixa ('Lasōra') could be traced. *Capparis aphylla* ('Karil') and *C. horrida* ('His') occurred quite freely in the company of *Zizyphus nummularia* ('Ber'), these last species evidently not appealing to cattle. On the eastern slopes, wherever the erosion was not severe, small pieces of *Tecoma undulata* ('Lohūri') were also found, with traces of *Diospyros montana* ('Pasendu'). The last species seemed to have been repeatedly eaten up, as only stem crowns could be seen. *Clerodendron phlomoides* ('Urni') appeared the most common plant throughout the ridge, and there is no doubt that at one time it must have formed the main undergrowth. On the tableland remnants of *Wrightia tinctoria* ('Dhūdi') had survived, and on its western slopes, near Dasghara, a small solitary remnant of *Olea cuspidata* ('Khivan') was found. This interesting find induced me to continue my search, but, as the result proved, it was the only specimen of wild olive there. Suckers of *Crataeva religiosa* ('Bharna') clearly indicated that the species prevailed in large forms in years gone by. A few *Acacia arabica* ('Kikar') and *A. ferruginosa* ('Kaiger') seemed to complete what appeared to be the bygone flora of the ridge. The absence of *Ficus religiosa* ('Peepal') and *Melia Azadirachta* ('Neem') may perhaps be due to the attraction they offer, in their young state, to porcupines.

My proposals for the reafforestation of the Southern Ridge, therefore, remained on the results of my earlier investigations, the object being to revive the original flora, supplemented by the introduction of allied species that would grow under identical conditions of climate, soil, &c. But, for the successful working of the scheme, it was imperative that the entire area should be fenced in so as to afford the necessary protection from cattle.

Before proceeding any further, it may not be out of place to say a few words about the formation of this ridge and the climatic conditions prevailing. The ridge in question may be said to lie in a south-westerly direction, and at its highest point dominates the city area, and when afforested and opened out with a system of drives the entire city will be seen. Besides its æsthetic effect and the beneficial influence on the atmosphere, it will check to an appreciable extent the effect of sand-storms &c.

The ridge is a quartzite rock, rising abruptly from the alluvial plain. It may be subdivided under three distinct heads: (1) the soil rock which presents no fissures to speak of and denuded of deposit of any kind; (2) the softer layer, chiefly composed of a porous quartz in a state of disintegration; and (3) the tableland which collects the erosion from the upper rocky layers where a small deposit of soil has collected.

Under the first very little can be attempted, as it would necessitate expensive blasting operations which would in very few instances break the rock beneath sufficiently to admit of roots finding their way to any depth; (2) and (3) afford possibilities of success, and these are being utilized for the afforestation operations hitherto conducted.

The average rainfall of Delhi seldom exceeds 27 inches, the chief

falls being in July and August. If from this is deducted the early monsoon and cold weather rains, which rarely exceed 4 inches, a balance of 23 inches is the rainfall proper. Of this comparatively poor average, half, owing to storms, benefits the ridge but little, as the rain washes away everything and brings about the erosion which has been the chief cause of denudation, carrying away each time whatever deposit has been formed by heavy sand-storms.

The extremes of temperature are also very great. In the summer 115° F. is but a common record in the shade, whilst in the sun the ridge rock becomes so heated that, by 10 o'clock during the summer months, it is impossible to walk on it. On the other hand, in the cold weather, the temperature often drops to 22° F., which is sufficiently cold to destroy numberless young seedlings.

The prevailing north-west hot winds that blow across the ridge during May and June can be compared with the Algerian sirocco, and, coupled with the radiation of heat from the exposed rocks, makes plant life very difficult to establish.

Besides the adverse climatic conditions prevailing, which cause a large percentage of mortality amongst newly planted trees, porcupines, hares, and rats account for the destruction of fully one-fourth of the seedlings, while white ants, always active in a new site brought under cultivation, are equally destructive. The grazing nuisance has been partly checked by fencing in all the sites and proclaiming them as Reserved Forest Area.

Two distinct methods of afforestation were originally suggested, one based on experience already gained, aiming at making use of natural depressions or pockets for planting or sowing operations; and the other, the ambitious terrace system, which aimed at terracing portions of the ridge and creating artificial tablelands by covering the rocks with clay brought from below (fig. 1). The latter method always appealed to the practical mind as a Utopian undertaking not justified by the expenditure it involved. It must of course be admitted, if funds were plentiful, that it would be the quickest way of reafforestation, and that it would greatly help to stop or check the erosion and retain the greatest portion of the rainfall for the benefit of the plantations, each terrace being made to retain its own rainfall plus the drainage of the hill area above. But the experiments conducted have proved prohibitive from a financial point of view, and yet the advantages it afforded for direct sowing, whenever the weather permitted, enabled young seedlings to gain the subsoil before the dry season set in. It must be admitted that this method would enable the ridge to be clothed with vegetation very rapidly, and I have no doubt that within five or six years, water being made available in sufficient quantity, the whole ridge could be so covered that no rock would be visible. This system is, however, for the time being, kept in abeyance, and I doubt whether it will ever be adopted in ordinary circumstances.

The method adhered to is, what may be termed, the natural

system, as was originally suggested for the northern ridge. This consists, as already partly described, in making use of all natural depressions wherever earth is being deposited and not subject to erosion. Natural depressions or pockets are excavated three to four feet in diameter if the surrounding rocks permit, and to corresponding depth if possible, wherever porous disintegrated stone is found, the pit (see diagram A) is dug out and refilled with clay from below.

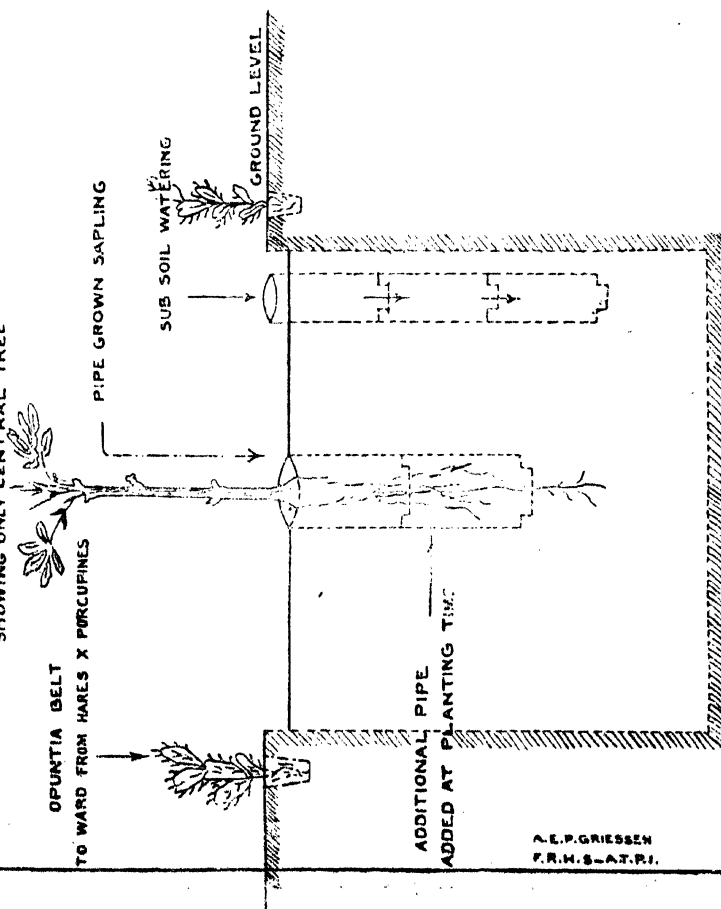
The pits or holes are excavated on an average 25 feet apart, which gives an average of seventy pits to the acre. Each of the pits is planted with a hardy pot- or pipe-grown tree, supported by three hardy similarly grown undergrowths, and beneath them again seeds of hardy species are sown at the beginning of the rains. It will be seen that each pit really accommodates four nursery-grown saplings. The process was arrived at after repeated failures to get seeds to germinate and thrive when afforestation was to be conducted by sowings. In many instances the main tree or one of the undergrowths thrives indifferently, but what actually remains meets the objects aimed at. There is no doubt that a certain amount of thinning out will have eventually to be done, but this will not be necessary for years, as the rate of growth under such adverse conditions is relatively slow. It may be added that most of these pits are surrounded by *Opuntia Dillenii* (fig. 10) as a protection against porcupines and hares; rats are easily disposed of with arsenic, and as to white ants—there is very little to be done as a protective measure—the best is to eliminate the species that are usually attacked by them.

Ravines (see diagram p. 105) will have to be gradually trained to stop as much as it is practically possible the "run off" by a series of bunds that will eventually prevent the disintegration of the sides and collect the erosion from the upland, thus eventually forming so many small tablelands. The sides of these ravines being in some cases almost perpendicular, it is proposed to clothe them with succulents such as Aloes, Agaves, Fourcroya, Euphorbia, and *Opuntia*, which are gradually being collected and grown for the purpose. These ravines, when established, will create a most pleasant contrast. It may be interesting to record that, without artificial watering, it would be an impossibility to carry out the work in the time it ought to be completed, and it would be best to leave Nature to do its work, though it may take half a century or more.

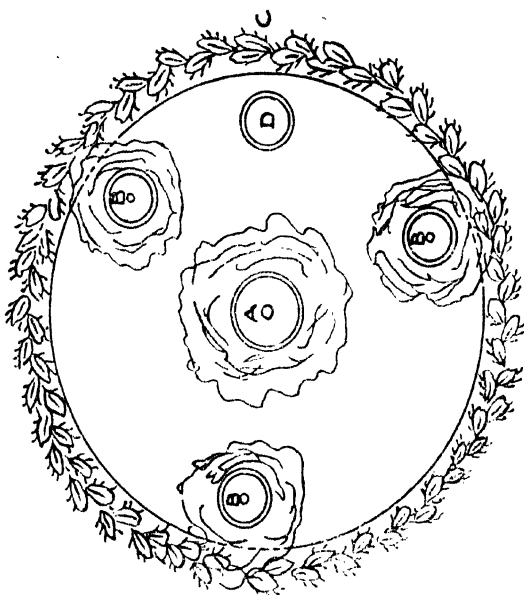
The method aimed at, is to tend these plantations for a period of four or five years (according to their position), by which time the vegetation should be sufficiently established to thrive by itself. These artificial waterings will gradually diminish; so that by the end of the fourth or the fifth year, as the case may be, when the monsoon sets in, the vegetation will be left to thrive by itself.

The distribution of water is, of course, one of the most difficult problems. Take, for instance, the watering of tree-pits at the rate of seventy an acre, amongst rocks and thorns over an area that will eventually cover approximately 2,500 acres. This will convey an idea of the

SECTIONAL DIAGRAM OF A 4 DIAMETER
PLANTING PIT
SHOWING ONLY CENTRAL TREE



PLAN OF A 4 DIAMETER PLANTING PIT
SCALE 1/8" = 1" INCH



REFERENCES

- A. CENTRAL TREE
- B. UNDER GROWTH SAPPLINGS
- C. OPUNTIA PROTECTIVE BELT
- D. INLET OF SUB SOIL WATERING PIPE

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T.S.Y. S. AMIR HASAN

labour the work involves, and when the ridge is afforested and gives the æsthetic touch to the New Capital which I believe it will, it will be difficult to realize the enormous efforts of the original undertaking.

Water is pumped and made available at one of the commanding points of the ridge and is taken into a main pipe feeder which follows as nearly as possible the contour level at which it is made available, minus, of course, the absolute necessary hydraulic grade to overcome friction.

Branch lines every 500 to 600 feet apart, or according to the configuration of the hillside, take water down the ridge slopes. Small cocks 200 to 300 feet apart enable water-carriers (*bhishties*) to fill their leather bags (*mashocks*), and the furthestmost distance these leather bags have to be carried seldom exceeds 300 feet or twelve lines of pits on either side of branch lines.

These afforestation operations were originally started on a tentative scale during 1914-15, when an area of 52·40 acres was treated on the natural system described. Prominence was given to sowing, with the unreliable result alluded to before, and it soon became evident that the only practical solution was the planting of nursery-grown saplings.

It is not that the seeds sown did not germinate, but, with the advent of the winter, most of the seedlings died owing to inadequate root action, the dry and cold season setting in before the roots could get deep enough to nourish the plants. It must also be said that the area originally selected for this tentative trial was, on the whole, not exactly suitable for the purpose.

Simultaneously with the above, a tentative trial on the terrace system was also made, covering actually an aggregate area of 4·55 acres. Sowings in furrows were resorted to and proved what has already been advanced on the subject in these notes. The success here is attributed to a uniform depth of good soil with an even moisture of surroundings, which it is impossible to attain with isolated pits some 25 feet apart. A reference to the photograph (fig. 9) will convey a better idea than pen can describe; a few nursery-grown saplings were also planted in the furrows, and these have already attained, comparatively speaking, to a large size, if the environments are taken into consideration.

The land between these terraces, representing approximately 16·45 acres, was also afforested, but on natural lines. The aggregate area treated during 1914-15 represents 73·40 acres, this acreage gradually developed by the warding staff to 103·40 acres as water could be spared. Further extensions were undertaken last year on the north and south of the old plantations, and these will represent an approximate acreage of 134 acres, which, added to the original work, brings the total area under afforestation work to 237·40 acres. It will be seen from the above that it represents a very small part of the whole of the 2,500 acres that really face the New Capital.



FIG. 9.—TERRACE AFFORESTATION (SEE SUBSOIL ROCK COVERED WITH THIN LAYER OF SOIL) SHOWING ARTIFICIAL TERRACING OF HILLSIDE.

(Planted 1916)

(To face p. 104.

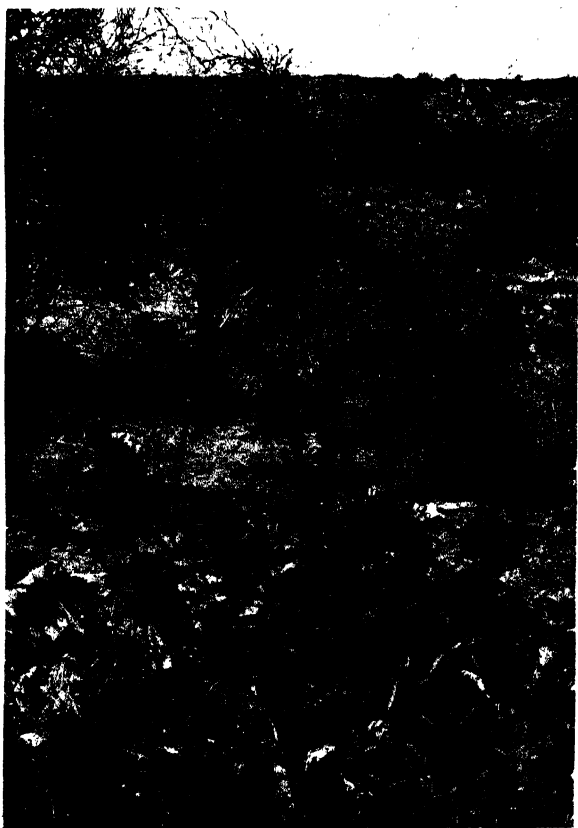


FIG. 10.—A PLANTED PIT SHOWING A LEAFLESS BOMBAX
IN THE CENTRE SURROUNDED BY THREE ACACIAS AND A
RING OF OPUNTIA AS A PROTECTING BELT. (See inlet of
subsoil watering pipe.)



FIG. 11.—PIPE-GROWN SAPLINGS ENCOURAGING DEEP
ROOTING.
(LEFT TO RIGHT: *MIMOSA ELengi*, *TAMARINDUS*
INDICA, AND *MIMOSA KAUKII*.)



FIG. 12.—RECOVERY OF DHAK (*BUTEA FRONDOSA*) THROUGH PROTECTION BY FENCING A "RESERVED FOREST AREA "

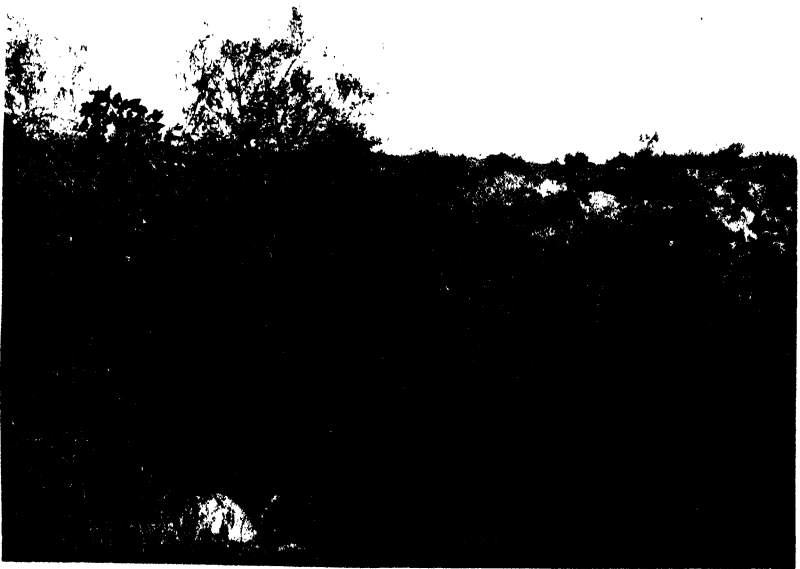
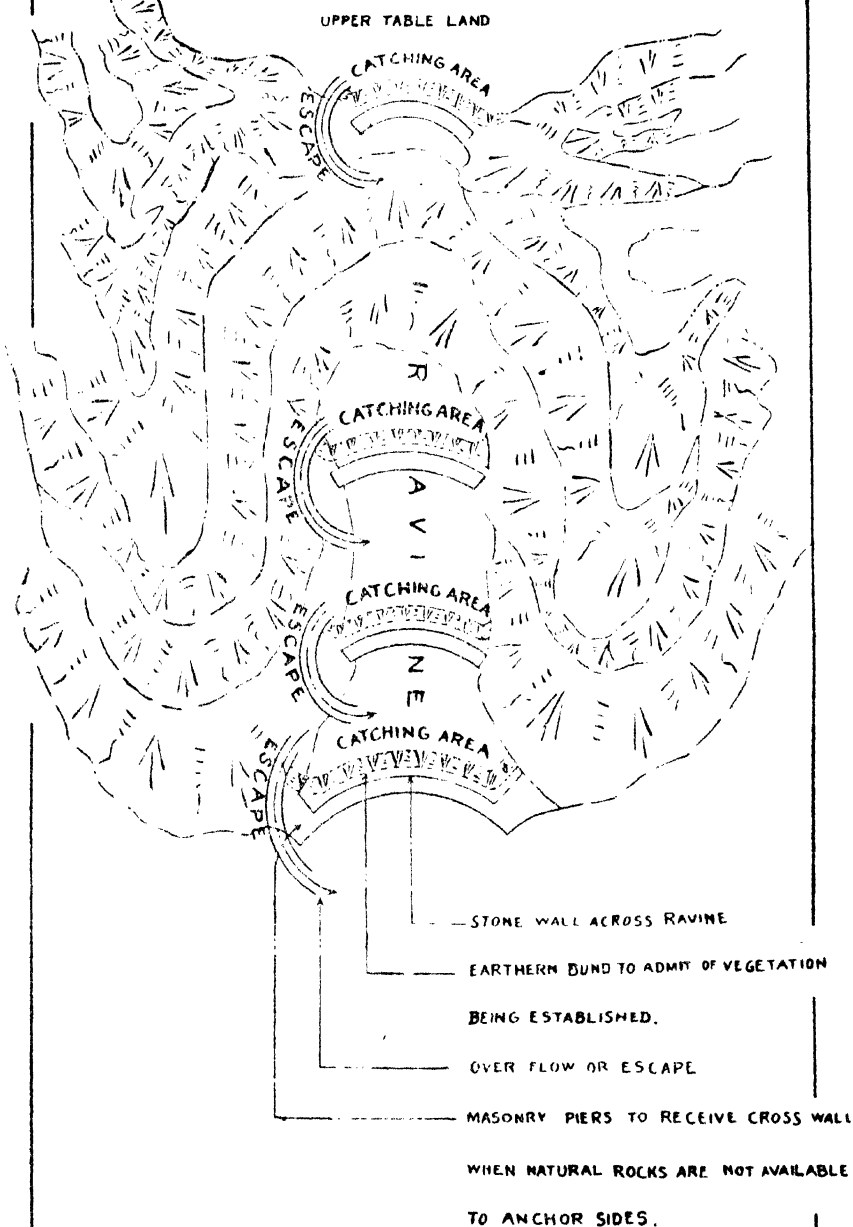


FIG. 13.—RECOVERY OF "AMALTAS " (*CASSIA FISTULA*) SURROUNDED BY ARMED SPECIES SUCH AS CARANDAS, CARISSA, DIOSPYROS, FLACOURTIA, TECOMA, ZIZYPHUS, ETC. THE RESULT OF FENCING A FOREST AREA.

[To face p. 105,

TRAINING OF RAVINES

TO MINIMISE DISINTEGRATION AND EROSION



Subsoil Watering.—Experience has demonstrated that surface watering has great drawbacks in the maintenance of an undertaking of this magnitude, evaporation being so great that, before water percolates into the subsoil by surface watering, the bulk is evaporated. To overcome this difficulty, the only alternative was to resort to subsoil watering by means of earthen pipes placed perpendicularly into planting pits. These pipes vary in diameter from 3 to 4 inches, and when filled with water convey to the subsoil their respective contents. This has the great advantage of inducing by capillary attraction a deep root action; whatever quantity of water is so given is conveyed some three feet beneath the earth as shown in the diagram on p. 103.

Once roots have reached a depth of three feet they eventually search for fissures in the rock, and the plantation is practically safe from surface drought. This contrivance is only suggested for dry track or torrid zones as occur in Upper India; it would be quite unnecessary in moist tracks, where the subsoil always contains a great percentage of moisture, which, by itself, is sufficient to attract a deep root action.

Preparation or Growing of Saplings for Dry Zone Afforestation.—It will be noticed that all dry zone vegetation is characterized by deep rooting. The hardier the tree is, the more powerful may be said to be its root action. Dry zone trees, as a rule, are somewhat slow to grow in their young stage, and they usually mature their seeds during the hot season, which enables them to fall to earth, to be blown by prevailing high winds into recesses and depressions in sheltered positions. With the advent of the rains, water usually collects in small quantities in these depressions and enables the seeds to germinate, but, after the rains are over and dry winds recur, the ground gradually dries up and it becomes a question how to meet this first struggle. It will be observed that many species practically die down to ground level, and it is at that critical period that the foundation is laid for their future. Practically speaking, only the root system remains, and during the cold weather months, and the following year's dry season, these roots shape themselves and suddenly throw out shoots, sometimes far more vigorous than those which a plant that had not to undergo the same hardship could do.

It will be readily seen from this that the raising of suitable dry zone trees for afforestation work of this kind calls for more attention than at first seems necessary. Growing in open nursery beds of trees that will eventually have to be transplanted into exposed forest tracts does not succeed with all species. No growing of tap-rooted species should ever be attempted in nursery beds, they should be grown in deep pots or pipes. The latter has proved very successful indeed and has the double advantage of admitting a deep rooting from the beginning (fig. 11). At the time of planting, another pipe of similar size filled with good earth can be placed below the pipe in which the sapling has been grown. This will induce the roots already made to continue their downward growth more rapidly.

These small earthenware pipes, being very porous, soon perish, and so everything possible to help the saplings can be considered to have been done. The pit thus planted, being provided with the subsoil watering contrivance above referred to, tends to favour deep rooting, and this is the real secret of success in dry zone afforestation works.

The illustration showing the sectional diagram of a dry zone planting pit with subsoil watering pipe (diagram p. 103) conveys as accurately as can be described the work involved in an afforestation scheme of this nature, viz. 70 main trees and 210 undergrowth or 280 nursery grown saplings to the acre. During the past two years approximately 152 acres have been treated, which represents handling of 42,650 saplings, everyone of them a pot- or pipe-grown plant. If to this is added 8 to 10 per cent. for damage in transit (as each sapling has to be carried across rocks to its position), it brings the total from 45,965 to 46,821, including planting casualties. There is also the inevitable mortality from stray animals, from prolonged periods of drought when water is not available, and from such pests as porcupines, hares, and rats, which are active during the dry season and in the winter months.

The mortality from all causes can be put down during the first years at 25 to 30 per cent., which shows that a work of this description could not be attempted without a nursery run on practical lines.

The protective belt of *Opuntia* planted around each pit (fig. 10) also involves a considerable amount of work, the bulk of the requirements having to be collected and brought from distances varying from one to three miles. Unlike the Northern Ridge this site possesses only a few stray specimens of the species, and to anyone who realizes what it means to handle cart-loads of such prickly plants the magnitude of the task will be apparent.

Ravine Training to check Disintegration and Erosion.—The training of ravines is another important factor in an undertaking of this kind; they are usually the result of the disintegration of the rock caused by the "run off," which again is the cause of the erosion that should be brought under control as much as possible. There are, of course, many points involved that govern the treatment to be applied; in some cases it may be almost impossible to devise a ravine training scheme that would dispose of the "run off," as the area actually drained by a ravine has to determine the precautions to be taken.

Some years ago, when the writer conducted the ravine training scheme necessary for the making of the Macdonnel Park at Agra, he was faced with earthen ravines varying between 100 to 250 feet wide, and the scouring that annually took place undermined the adjoining land to such an extent that the sides became almost perpendicular. Each storm gradually undermined the sides, and slices of earth would get detached from the main body, temporarily blocking the outflow and causing extensive damage, choking drains and culverts, and sometimes cutting across metalled roads.

The first problem was to ascertain the acreage or area drained by these ravines, then to divert the drainage in such a way as to divide it proportionally through the various existing ravines. Then came the huge bund treatment which was to check the "run off." Lakes were thus formed during the rains, and each reservoir or catching area had to be provided with a safety outlet or escape so as not to imperil the whole scheme, each catching area becoming a lake after its superimposed one had been filled, and this procedure had to be followed till the overflow of the entire system was made to run into the river.

Large quantities of rainfall were so retained, the gradual silting up of the beds of these ravines or lakes went on with remarkable rapidity. Similar operations were also conducted within the Government Grass Farm Lands, and in less than five years the topography of the place had changed.

Permanent lakes combining beauty with utility were then made, and these now collect most of the rainfall, the upper lake discharging into those on the lower levels, which beds have been so designed as to make use of every drop of water for irrigation of low-lying grounds. When these lakes are emptied, they are fed from the canal, and are a component part of one of the most effective Park irrigation schemes met with in India.

The difference of levels between the feeding minors and the lakes is utilized to work several sets of hydraulic rams that force water to the high ground, enabling over 75 acres of highland to be irrigated.

A similar treatment of ravines was also conducted some twenty-five years ago at the Allahabad Grass Farm. Hence, we have object-lessons that should be generally applied throughout Upper India.

On the Southern Ridge the training of ravines should in the first instance aim at retaining the "run off" from all tablelands, and this can be easily done by providing against the heaviest recorded rainfall that may have taken place over a certain number of years. The heavy downpour experienced during the year of the last Durbar, which amounted to about 8 to 9 inches in 36 hours, may be taken as a basis; this, with the area draining on the tableland or particular catching area, would determine the height and relative position of the protective cross bund or bunds. It will be understood that the above will lead to most of the upland "run off" being disposed of at once and retained at its highest possible level, relieving the ravine beneath. The diagram on p. 105 illustrates the above. It will be seen that the second cross ravine bund has a comparatively small strain and so on till the position of the last cross ravine bund, which will be found necessary, is determined.

In this particular case these cross ravine training bunds are made of dry stone walling, but it is a question whether it would not be more economical to make them in lime masonry and convex against the flow of water (this is the distinction between stone or masonry bunds and earthen ones). A comparatively small section should in some cases suffice to resist the inrush of water, but stone being abun-

dant, these bunds may be made as pitching, but they should be so built that the weight of water or earth at their back would close their joints and make them stronger.

It is imperative that the position of these bunds be properly selected and their foundation embedded into the sub-rock or resting against a cross rock, if existing, so that the basé will not give away. As to the sides, they should be anchored against natural rocks, and here, also, the necessity of providing side escapes should not be overlooked (see the arrow on the diagram on p. 105), as they will act as safety valves, taking the excess of water (if necessary) away through a rocky course and not endangering or undermining the newly-constructed protective bund. Though conditions differ according to position &c., yet the principles remain the same.

In some places the inrush of water may not be controllable before it reaches almost the foot of the ridge. Here, I would say, after making provision to catch the product of the erosion, a masonry fall may lead the surplus water to the drain below, thus checking as far as possible the disintegration that takes place year by year in some of the low-lying ravines of the western slopes. Practically the first step in this matter would be, not to attempt the treatment of the ravines proper, but the uplands where the ravine actually begins. This is the common practice resorted to by hillmen. Subsequently the ravine cross bunds could be dealt with where necessary.

In the process of time, these catching areas will gradually get filled up, creating more or less level tablelands which will accommodate a sturdy deep-rooting vegetation, which will play an important part in binding together the silt deposited by the erosion of the hillsides above. Very little will eventually be gained by raising the level of these cross bunds, unless it is for further check, aiming at retaining the rainfall, but there is a limit beyond which one may not with safety go. Each tableland will by its natural formation absorb the great percentage of the rainfall it will receive, and subsequently induce percolation into the hillsides.

A great deal could be written on the subject, but it is hoped that the day will not be distant when the above can be practically demonstrated.

Nature's Revival.—The actual revival of its original flora is a striking example of Nature's power of recuperation. This, of course, only refers to certain portions of the area which are somewhat distant from the vicinity of the old city, where cattle grazing and the destruction of the scrub vegetation for fuel purposes has not been so systematically carried out.

The two photographs illustrating Nature's revival (figs. 12, 13) should convey an object-lesson of the conditions under which plant life makes way in adverse circumstances. In most cases the armed species must have grown first, and subsequently, in their midst under the influence of their protection and shelter, other species, which are usually attacked in their young state by such pests as porcupines and hares, have found a safe and congenial place; in other parts, between fissures

of rocks, where the young seedlings were protected from the ravages of stray animals, the old crowns and roots have survived and now show signs of vigorous growth.

A reference to the photographs already mentioned, though these are not very clear, shows the composition of some of these natural groups. Most of the species traceable are remarkable for their deep rooting. Notable amongst these are two species of *Capparis*, viz. the 'Karil' and the 'His'; and the *Carissa spinarum*, or wild 'Karonda,' which must have been repeatedly cut down to ground level for fuel. The last species may take years to revive, but is springing up in many places; in fact, during the past two years some of these plants have begun to fructify. Then we have the 'Pasendu' (*Diospyros montana*), which has made a wonderful recovery. The 'Lohūri' (*Tecoma undulata*), which is a species difficult to raise under cultivation, in this part of India is coming up freely. A species of 'Grewia' (*Phalsa*) has been traced, and not less remarkable is the recovery of the 'Dhak' (*Butea frondosa*) and the 'Amaltas' (*Cassia fistula*). With the advent of this afforestation work and the proper warding of the area, it will be possible in a few years to reconstruct the entire original flora of the site.

What Nature has already demonstrated.—Besides the wonderful recuperative power of Nature alluded to in the revival of the original flora of the ridge, it may not be out of place also to record the newly-planted species that have already fructified. This will go a long way to demonstrate the adaptability of certain species to these environments.

The following species have already fruited :

Melia Azadarach	Bakain.
Terminalia arjuna	Arjun.
Prosopis juliflora	Mesquite bean.
Acacia Farnesiana	Sweet-scented Babool.
Dalbergia Sissoo	Shisham.
Thevetia nerifolia	Pila Kanar.
Dadonia viscosa	Rallia.
Parkinsonia aculeata	Christ Thorn.

The tendency to fructify demonstrates their adaptability for the purpose, and will lead to the introduction of allied species which will greatly enhance the interest of the plantations. It will only remain for us to read and to comprehend that wonderful book which Nature provides us and to make use of its interesting contents.

Owing to the impossibility at present of working out an annual programme, it is extremely difficult to know in what proportion the stock of plants is to be raised. Many of the species used have to be planted out the first year, otherwise they become potbound, are expensive to maintain, and when planted out they have lost their first vigour. Let us hope that, now the great world conflict is over, it will be found possible to adhere to a regular annual programme, when we shall be able to give to our New Capital the dominating green and restful horizon contemplated.

ORIGINAL FLORA OR VEGETATION OF THE DELHI SOUTHERN RIDGE.
TRACED IN 1912-13.

*1. <i>Acacia arabica</i>	Kikar.
*2. <i>Acacia ferruginosa</i>	Kaiger.
*3. <i>Butea frondosa</i>	Dhak.
4. <i>Capparis aphylla</i>	Karil.
5. <i>Capparis horrida</i>	His.
6. <i>Calotropis procera</i>	Ak.
7. <i>Carissa spinarum</i>	Karonda.
8. <i>Clerodendron phlomoides</i>	Urni.
*9. <i>Cordia mixa</i>	Lasōra.
*10. <i>Crataeva religiosa</i>	Bharna.
*11. <i>Diospyros montana</i>	Pasendu.
12. <i>Khretia laevis</i>	Koda.
*13. <i>Olea cuspidata</i>	Khiwan.
*14. <i>Tecoma undulata</i>	Lohūri.
*15. <i>Wrightia tinctoria</i>	Dhūdi.

* Species that are being reintroduced.

SPECIES INTRODUCED THAT ARE DOING WELL.

1. <i>Acacia Farnesiana</i>	Vilayati Babool.
2. <i>Acacia modesta</i>	Polosa.
3. <i>Albizia amara</i>	Lallei.
4. <i>Albizia Lebbeck</i>	Siris.
5. <i>Anegissus pendula</i>	Dhao.
*6. <i>Bombax malabarica</i>	Samal.
7. <i>Dadonia viscosa</i>	Rallia or Sonatty.
8. <i>Dalbergia Sissoo</i>	Shisham.
9. <i>Kigelia pinnata</i>	Mozambique sausage tree.
*10. <i>Melia Azadarach</i>	Bakain.
11. <i>Parkinsonia aculeata</i>	Christ Thorn.
12. <i>Pongamia glabra</i>	Papar.
13. <i>Prosopis juliflora</i>	Mesquite.
14. <i>Opuntia Dillenii</i>	Nāgphana.
15. <i>Tecoma stans</i>	
16. <i>Thevetia neriifolia</i>	Pila kanar.
17. <i>Tithonia speciosa</i>	
18. <i>Ulmus integrifolia</i>	Papri.

* Species to be protected from porcupines.

SPECIES INTRODUCED THAT GROW INDIFFERENTLY.

1. <i>Bauhinia purpurea</i>	Kolar.
2. <i>Bauhinia racemosa</i>	Kachnal.
3. <i>Bauhinia variegata</i>	Kachnar.
**4. <i>Casuarina equisetifolia</i>	Beef wood.
5. <i>Celtis australis</i>	Jagho.
6. <i>Erythrina indica</i>	Pangra.
7. <i>Eucalyptus of sorts</i>	Blue Gum.
*8. <i>Ficus infectoria</i>	Pilkhan.
*9. <i>Ficus glomerata</i>	Gular.
*10. <i>Ficus religiosa</i>	Peepal.
**11. <i>Inga dulcis</i>	Vilayati Imli.
*12. <i>Melia Azadirachta</i>	Neem.
13. <i>Millingtonia hortensis</i>	Neem chameli.
14. <i>Zizyphus jujuba</i>	Bera.

* Species repeatedly attacked by porcupines.

** Species repeatedly attacked by white ants.

NEW SPECIES THAT ARE BEING INTRODUCED.

1. <i>Acacia Catechu</i>	.	.	.	.	Kair.
2. <i>Acacia latronum</i>	.	.	.	.	Bhes.
3. <i>Acacia rupestris</i>	.	.	.	.	Khor.
4. <i>Ailanthus excelsa</i>	.	.	.	.	Arua.
5. <i>Aloes of sorts.</i>	.	.	.	.	Succulent plants.
6. <i>Anona squamosa</i>	.	.	.	.	Sharifa.
7. <i>Cassia fistula</i>	.	.	.	.	Amaltas.
8. <i>Caesalpinia coriaria</i>	.	.	.	.	Devi-Devi.
9. <i>Crystostegia grandiflora</i>	.	.	.	.	Dhudee.
10. <i>Fourcroya gigantea</i>	.	.	.	.	Succulent.
11. <i>Gardenia turgida</i>	.	.	.	.	Thanella.
12. <i>Jatropha Curtas</i>	.	.	.	.	Safed ind.
13. <i>Manihot Glaziovii</i>	.	.	.	.	Ceera rubber.
14. <i>Phoenix sylvestris</i>	.	.	.	.	Khajoor.
15. <i>Prosopis spicigera</i>	.	.	.	.	Jand.
16. <i>Punica Granatum</i>	.	.	.	.	Sharifa.
17. <i>Tamarindus indica</i>	.	.	.	.	Imli.

SEEDLING DAFFODILS SELECTED TO GROW ON
AT BRODIE CASTLE.

By IAN BRODIE, of Brodie.

WHEN I first began to grow Daffodils (it was in 1898), I had no sort of guide to tell me what flowers to grow, or, when grown, how they should best be mated so as to produce children who would be a credit to their parents (and to their godfather). I worked entirely in the dark, blindly feeling my way. The result was that, for some years after the seedlings began to bloom, I searched in vain for a flower that could really be called a flower. Things are better now, but still a beginner requires help; and it is in the hope that the following notes may be of some use in that direction I have had the temerity to send them for publication. I have added, at the end, a short list of more or less inexpensive varieties which I have found useful for breeding; but in case the novice is more ambitious the following are also very good as parents:

Monarch.
Ben Alder.
Mrs. Ernst Krelage.
White Emperor.

Miss Clinch.
Vestal Virgin.
Morven.

Lord Kitchener.
Hypatia.
Emerald Eye (pollen).

- 48/11 = Bernardino × Poet—very good; the cup has a wire edge of red.
93/11 = Great Warley × Lord Kitchener—very large Leedsii.
107/11 = 23/00 (King Alfred × Weardale) × Felspar—bicolor Incomparabilis.
230/11 = Dorothy × Kestrel.
262/11 = Will Scarlett × Bernardino—three selected.
288/11 = Red Chief × Kingsley.
326/11 = 358/02 (Cassandra × Bernardi var.) × Dark Red-crowned Seedling—the darkest bit of colour I have yet seen.
354/11 = 691/05 (Mrs. Bowley × Will Scarlett) × Kestrel.
398/11 = 793/05 (Cassandra × Recurvus Seedling) × 557/05 (Mrs. Bowley × Poet).
421/11 = Minnie Hume × Moonbeam.
199/11 = Minnie Hume × Empire.
446/10 = Aftermath × 662/04 (Lulworth × Virgil)—a large and much improved Aftermath.
447/10 = Beacon × 662/04 (Lulworth × Virgil).
456/11 = Moonbeam × Matthew Arnold—a tall pure white flower.
451/11 = Moonbeam × Seabird—a good flower, pure white with Seabird perianth; tall.
340/11 = 261/05 (Santa Maria × Weardale) × Dark Yellow Ajax Seedling.
307/11 = Cassandra × Creole (Princess Mary × Will Scarlett).
145/11 = Minnie Hume × Lemon Star.
523/12 = 254/08 (Comus × Barrii var.) × Socrates—two selected.
272/12 = Giraffe × Bernardino—two selected, one a Leedsii and the other an Incomparabilis.
131/12 = 23/06 (King Alfred × Weardale) × 48/05 (M. J. Berkeley × King Alfred)—two selected; tall and very large and decorative yellow Ajax.
607/12 = 557/05 (Mrs. Bowley × Poet) × Matthew Arnold.
671/12 = Oliver Goldsmith × Hildegard.
484/12 = 358/02 (Cassandra × Bernardi var.) × Socrates.

- 313/12 = Pilgrim x Ben Alder (King Alfred x Lord Roberts)—a huge palest lemon Incomp.
- 99/12 = Florence Pearson x Mrs. R. Sydenham—good white Ajax.
- 269/12 = Mrs. Betteridge x Bernardino—a Giant Leedsii.
- 305/12 = Mme. de Graaff x Ben Alder (King Alfred x Lord Roberts)—a tall and very late Ajax of two shades of pale yellow.
- 117/12 = Lady M. Boscawen x Conqueror—a Giant Leedsii.
- 202/12 = White Knight x Empire—a Giant Leedsii.
- 128/12 = 66/06 (Santa Maria x King Alfred) x Seedling (M. J. Berkeley x K. Alfred).
- 95/12 = Ben Alder (King Alfred x Lord Roberts) x Cleopatra.
- 361/12 = Marina x Hypatia—a good pale-eyed Barrii.
- 399/12 = Cossack x Socrates—good.
- 610/12 = Moonbeam x Hypatia—a white-flowered double with some green in the centre; very pretty.
- 275/12 = Mme. de Graaff x White Star—Giant Leedsii.
- 96/12 = 66/06 (Santa Maria x King Alfred) x Cleopatra—extra good yellow Ajax.
- 37/12 = 271/03 (Minnie Hume x Stella superba) x Conqueror.
- 201/12 = Van Waveren's Giant x Empire—Giant Leedsii.
- 147/13 = King Alfred x Mrs. Ernst Krelage—a good light yellow Ajax.
- 78/13 = Ben Avon x Mrs. Ernst Krelage—good yellow Ajax.
- 99/13 = Felspar x Empire—an extra good Leedsii; very large, and opens quite white from the start.
- 109/13 = Lemon Star x Mrs. Ernst Krelage—Giant Leedsii.
- 112/13 = Lemon Star x Mrs. R. Sydenham—six selected, all white Ajax and taller than Mrs. R. Sydenham.
- 732/13 = Snowshoe x Selected Pyrenæan Poet.
- 703/13 = Oliver Goldsmith x Hildegard.
- 205/13 = Creole (Princess Mary x Will Scarlett) x Blood Red—good late Barrii.
- 370/13 = Pale-eyed Seedling x Ivoryine—a pale-eyed Barrii.
- 319/13 = Beacon x Ben Alder (King Alfred x Lord Roberts)—two selected; very good dark yellow self Incomps.
- 316/13 = 232/09 (Weardale x Bulldog) x Ben Alder (King Alfred x Lord Roberts)—good; very large yellow Ajax.
- 306/13 = Pilgrim x Yellow Ajax Seedling—good deep yellow Incomparabilis.
- 397/13 = 125/08 (Mrs. Betteridge x White Ajax) x Miss Clinch—late white Ajax.
- 649/13 = 557/05 (Mrs. Bowley x Poet) x Socrates—two selected.
- 464/13 = Weardale x Lemon Star—Giant Leedsii.
- 250/13 = 239/06 (King Alfred x Lord Roberts) x 290/07 (Lady M. Boscawen x K. Alfred).
- 248/13 = 122/08 (Mme. de Graaff x White Ajax) x Mrs. Ernst Krelage.
- 266/13 = Princess Mary x Masterpiece.
- 110/13 = Morven x Mrs. Ernst Krelage—two selected; good pale Ajax.
- 75/13 = 179/07 (Lady M. Boscawen x King Alfred) x Empire—EXTRA GOOD; a very large Incomparabilis of two shades of yellow.
- 138/13 = Morven x Empire—a Giant Leedsii.
- 101/13 = Loch Fyne x Empire—a large Leedsii.
- 283/14 = Socrates x 803/07 (Will Scarlett x Poet)—three selected.
- 341/14 = 557/05 (Mrs. Bowley x Poet) x Yeoman of the Guard.
- 348/14 = 401/10 (Dorothy Wemyss x Cassandra) x Hildegard—four selected.
- 418/14 = 400/09 (Comus x Acme) x 803/07 (Will Scarlett x Poet).
- 445/14 = 439/10 (Pale Seedling x Ethelbert) x Moonbeam.
- 457/14 = Snowshoe x Pinkie.
- 361/14 = 793/05 (Cassandra x Recurvus Seedling) x Kingsley—large Poet.
- 349/14 = 430/10 (Oliver Goldsmith x Acme) x Hildegard—extra good Poet.
- 45/14 = Lemon Star x White Emperor—Giant Leedsii.
- 339/14 = 324/10 (Bernardi var. x Poet) x Yeoman of the Guard—good; large flat eye of bright orange.
- 381/14 = 398/10 (Recurvus x Acme) x Red-crowned Seedling.
- 451/14 = 288/11 (Poet x 557/05 (Mrs. Bowley x Poet)) x Socrates.
- 136/14 = Findhorn (Mme. de Graaff x Lady M. Boscawen) x Nevis (White Ajax).
- 50/14 = 125/08 (Mrs. Betteridge x White Ajax) x White Emperor—two selected.
- 69/14 = King Alfred x Socrates—yellow Incomp.
- 185/14 = Pinkie x Hypatia—three selected; pretty pink-rimmed eyes.

- 124/14=Hon. Mrs. Franklin × Mrs. Ernst Krelage—three selected; large Giant Leedsii.
 301/14=164/09 (Minnie Hume × Weardale) × 126/08 (Weardale × Leedsii).
 269/14=Monarch × White Emperor—light yellow Ajax.
 281/14=Oliver Goldsmith × 803/07 (Will Scarlett × Poet).
 291/14=213/08 (Bernardi Seedling × Acme) × 803/07 (Will Scarlett × Poet).
 259/14=138/08 (Pale-eyed Seedling × Ariadne) × Emerald Eye—a beautiful flower of the Emerald Eye type, but ten days earlier.
 182/14=King Alfred × Moonbeam—a lemon self Incomparabilis.
 122/14=Loch Fyne × Mrs. Ernst Krelage—a large Giant Leedsii.
 138/14=156/09 (Minnie Hume × King Alfred) × Nevis (White Ajax)—good Giant Leedsii; three selected.
 126/14=Bernardino × Mrs. Ernst Krelage—two selected; Giant Leedsii.
 211/14=Minnie Hume × Mrs. Ernst Krelage.
 76/14=179/07 (Lady M. Boscawen × King Alfred) × Macebearer—a good Incomparabilis.
 239/14=Fleetwing × Morven—Giant Leedsii.
 45/14=Lemon Star × White Emperor—good Giant Leedsii.
 392/14=Snowshoe × Red-crowned Seedling.

Of Poets I find Hildegard one of the best to use as a parent either way. Mrs. Ernst Krelage is giving good seedlings of fine form.

Pilgrim is a useful flower to work with; it gives very large seedlings.

Laughing Water is a very good seed parent—its children are very refined and smooth.

Seedlings from Will Scarlett × Poets, when used as pollen parents on to Poets, give a good percentage of good flowers with very bright eyes.

Cleopatra is a useful pollen flower.

Van Waveren's Giant is a good seed parent.

Beacon crossed with Ajax, Giant Incomparabilis, and Leedsii gives some very nice seedlings of good form and substance.

Bernardino gives good seedlings either way.

Empire is a very good parent either way.

Lemon Star and Loch Fyne are both useful.

Mrs. R. Sydenham a good pollen flower, giving very white seedlings—it is best mated with good Giant Leedsii, the effect of which is to shorten the crowns and lengthen the stems; almost all the seedlings will be Ajax.

White Emperor promises very well.

As a stud for a beginner I should recommend the following to start with (they are none of them very expensive now):—

King Alfred	Laughing Water	Lemon Star
Cleopatra	Princess Mary	Minnie Hume
Van Waveren's Giant	Pilgrim	Hildegard
Mme. de Graaff	Beacon	Matthew Arnold
Weardale	Empire	Socrates
Bernardino		

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XXXV.—EFFECT OF GRASS ON APPLE TREES.

By A. N. RAWES and F. J. CHITTENDEN, F.L.S., V.M.H.

ALMOST universal experience bears out the results obtained at the Ridgmont Experimental Fruit Farm by the Duke of Bedford and Mr. S. U. Pickering in experiments upon the effect of growing fruit-trees in grass, yet even now new plantations are not infrequently allowed to become covered with grass up to the trees with bad effect upon the latter and disappointment and loss to the grower.

Row 1	Row 2	Row 3	Row 4	Row 5	Variety and Stock.
E	F*	E*	E**	E**	Emperor Alexander on Paradise.
D	D*	D*	D**	D**	Beauty of Bath on Crab.
C	C*	C*	C**	C**	Newton Wonder on Crab.
B	B*	B*	B**	B**	Manks Codlin on Crab.
A	A*	A*	A**	A**	Ribston Pippin on Paradise.

FIG. 14. SHOWING ARRANGEMENT OF TREES IN DEMONSTRATION PLOT. 1st row in cultivated ground; 2nd and 3rd rows* with grass to 1 foot 6 inches of stem; 4th and 5th rows** grassed up to stem.

It is true that in some circumstances which are not yet understood the trees do not appear to suffer to any appreciable extent, and it is possible that in other circumstances after years of struggle they may (unless they have died before—and it takes years of struggle to kill a tree) recover and eventually form fairly good trees; but while this struggle is going on the loss of crop is great and not to be compensated for by any gain from the presence of grass about the trees, arising either from grazing value or from doing away with the necessity of using the hoe frequently.

The records given here are taken from a plot planted for demonstration purposes at Wisley. They add nothing to what is already known and establish no new principle, but we make no apology for publishing them if they serve to drive home the lesson taught by the Ridgmont experiments, and deter some of those who, among the many likely to plant fruit-trees in the near future, designed to plant them in grass, or persuade others who have unthrifty young trees in grass to remove it and keep the ground cultivated for a few years.

The ground in which the trees were planted was prepared in 1911. It was poor pasture, chalked, ploughed, and manured with farmyard

manure at the rate of 20 tons to the acre and with sulphate of ammonia and superphosphate, after which a crop of early potatoes was taken. In August mustard was sown and ploughed in in November. The trees were planted ten feet apart each way in January 1912 in open weather. They were as nearly as possible of a size at planting time and were of the same age. There were five varieties and five trees of each variety. After planting; turf was laid up to the stems of two trees of each variety and so as to leave a circle of three feet of bare soil about the stems of two others, the fifth tree in each case being cultivated all round. Figure 14 on page 116 shows the arrangement of the plot.

The soil about the trees in the 1st row has been continuously cultivated; the soil in the space about the trees in rows 2 and 3 has been kept bare of grass and stirred at intervals. The grass has been cut two or three times a year but not removed, so the soil has lost nothing from the presence of the grass (except water and oxygen taken by the grass roots).

The tables on pages 118 and 119 show the amount of growth made by the trees in each year since planting; the first showing the total length of the new shoots made each year, the second the diameter of the stem at nine inches from the ground in each year (except 1917).

It will be seen that the growth of the trees with the space about them has been consistently greater than that of the trees with grass up to their stems * (indeed; in some cases the latter are smaller than when they were planted—they have never made up the length of stems removed when they were first pruned, and in one case the tree is dead), and this has been exceeded in a marked measure by the trees in cultivated ground, in every case in every year. The crops borne tell the same tale, as the following table shows:

TOTAL NUMBER OF FRUITS PRODUCED BY EACH TREE 1912-1919.

	In Grass.		In 3 feet clear space.		In cultivated land.
	1	2	1	2	1
Ribston Pippin .	0	0	0	27	192
Manks Codlin .	0	5	6	8	297
Newton Wonder .	0	0	0	0	77
Beauty of Bath .	0	0	14	5	21
Emperor Alexander .	2	16	66	28	224

As usual, there is a marked contrast between the colour of the foliage of the trees in the cultivated ground and those with grass about them, the latter being much more yellow in tinge; the few fruits produced on the latter trees have been on the whole smaller than the many on the former.

* One tree of Manks Codlin in grass is an exception to this, for it has exceeded in some cases since 1914 the growth of either of the trees with the cultivated space around them.

TOTAL ANNUAL GROWTH OF TREES IN GRASS.

	In Grass.		In 3 feet clear space.		In cultivated land.
	Tree 1	Tree 2	Tree 1	Tree 2	Tree 1

Ribston Pippin on Paradise Stock.

Growth made in 1912	10"	27"	30"	80"	292"
do. 1913	12.5"	17"	15"	84"	556"
do. 1914	11"	21"	15"	154"	757"
do. 1915	2"	5"	14"	83"	1200"
do. 1916	5"	21"	20.5"	184"	1566"
do. 1917	7"	53"	20"	498"	960"
do. 1918	<u>none</u>	<u>none</u>	<u>4"</u>	<u>286"</u>	<u>1225"</u>

Manx Codlin on Crab Stock.

Growth made in 1912	15"	10"	15"	42"	42"
do. 1913	20.5"	14"	41"	42"	252"
do. 1914	20"	90"	72"	102"	413"
do. 1915	10"	93"	27"	54"	468"
do. 1916	9"	115.5"	80.5"	190"	1431"
do. 1917	12"	336"	192"	288"	888"
do. 1918	{ tree nearly dead }	<u>174"</u>	<u>120"</u>	<u>136"</u>	<u>1074"</u>

Newton Wonder on Crab Stock.

Growth made in 1912	33"	73"	141"	109"	244"
do. 1913	16.5"	17"	105"	136"	600"
do. 1914	24"	105"	366"	254"	1146"
do. 1915	17"	150"	492"	408"	1866"
do. 1916	78"	297"	528"	496"	1652"
do. 1917	42"	586"	1056"	1332"	1794"
do. 1918	<u>276"</u>	<u>300"</u>	<u>564"</u>	<u>606"</u>	<u>1896"</u>

Beauty of Bath on Crab Stock.

Growth made in 1912	9"	16"	58"	35"	146"
do. 1913	41.5"	25"	90"	60"	336"
do. 1914	6"	18"	120"	90"	336"
do. 1915	7"	24"	105"	126"	768"
do. 1916	10.5"	15"	165"	118"	845"
do. 1917	32"	101"	154"	492"	748"
do. 1918	<u>57"</u>	<u>82"</u>	<u>63"</u>	<u>315"</u>	<u>720"</u>

Emperor Alexander on Paradise Stock.

Growth made in 1912	12"	28"	113"	44"	80"
do. 1913	12"	27"	142"	51"	138"
do. 1914	19"	48"	90"	66"	222"
do. 1915	6"	50"	129"	47"	414"
do. 1916	24"	93"	175.5"	131"	1135"
do. 1917	12"	212"	288"	132"	558"
do. 1918	<u>79"</u>	<u>180"</u>	<u>258"</u>	<u>135"</u>	<u>1464"</u>

DIAMETER OF STEMS NINE INCHES ABOVE SOIL LEVEL IN EACH YEAR SINCE PLANTING.

		In grass.		In 3 feet clear space.		In cultivated land.
		Tree 1	Tree 2	Tree 1	Tree 2	1
<i>Ribston Pippin on Paradise Stock.</i>						
At planting	1912	0.425	0.3	0.475	0.425	0.55
Winter	1912	0.425	0.34	0.44	0.45	0.55
do.	1913	0.43	0.395	0.49	0.57	0.97
do.	1914	0.46	0.44	0.49	0.66	1.5
do.	1915	0.45	0.42	0.49	0.66	1.74
do.	1916	0.45	0.44	0.56	0.74	2.4
do.	1917	?	?	?	?	?
do.	1918	0.5	0.62	0.7	1.3	3.5
<i>Manx Codlin on Crab Stock.</i>						
At planting	1912	0.425	0.625	0.375	0.55	0.55
Winter	1912	0.49	0.7	0.42	0.59	0.6
do.	1913	0.46	0.73	0.44	0.6	0.87
do.	1914	0.49	0.78	0.56	0.71	1.2
do.	1915	0.5	0.785	0.565	0.84	1.6
do.	1916	0.5	0.91	0.61	0.99	1.83
do.	1917	?	?	?	?	?
do.	1918	0.6	1.7	1.1	1.5	2.5
<i>Newton Wonder on Crab Stock.</i>						
At planting	1912	0.625	0.8	0.85	0.75	0.95
Winter	1912	0.625	0.92	0.87	0.62	1.07
do.	1913	0.64	0.88	0.93	0.88	1.4
do.	1914	0.66	1.01	1.37	1.19	1.99
do.	1915	0.74	1.14	1.38	1.56	2.62
do.	1916	0.83	1.48	1.68	1.86	4.0
do.	1917	?	?	?	?	?
do.	1918	1.1	2.0	2.8	3.1	4.25
<i>Beauty of Bath on Crab Stock.</i>						
At planting	1912	0.775	0.6	0.7	0.575	0.825
Winter	1912	0.75	0.63	0.69	0.56	0.85
do.	1913	0.76	0.68	0.73	0.68	1.2
do.	1914	0.85	0.68	0.92	0.89	1.53
do.	1915	0.86	0.71	0.99	1.01	1.78
do.	1916	0.86	0.72	1.19	1.18	2.16
do.	1917	?	?	?	?	?
do.	1918	0.9	0.81	1.6	1.8	3.02
<i>Emperor Alexander on Paradise Stock.</i>						
At planting	1912	0.525	0.575	0.725	0.475	0.675
Winter	1912	0.57	0.57	0.75	0.47	0.67
do.	1913	0.57	0.55	0.83	0.56	0.88
do.	1914	0.57	0.68	0.9	0.65	1.3
do.	1915	0.57	0.68	0.99	0.66	1.4
do.	1916	0.57	0.72	1.20	0.70	2.20
do.	1917	?	?	?	?	?
do.	1918	0.7	1.2	1.52	1.25	2.625

ORIENTAL POPPIES AT WISLEY, 1917.

THREE plants of each of eighty stocks of Oriental Poppies were received for trial at Wisley in the autumn of 1915, and were grown on for judging when thoroughly established in 1917. Most of them grew well and flowered satisfactorily: where the contrary occurred note is made in the descriptions. The form known as *Papaver bracteatum* is often distinguished in gardens from *P. orientale* by its greater height and by the presence of a bract immediately below the flower; but since the garden value of the plants is much the same whether the bracts are present or not, and since also bracts are sometimes present in a variety and sometimes absent, no attempt has been made to give the bracts a classificatory value in the following notes. It will be seen, however, that some varieties are much dwarfer than others, and that there is a marked difference in the size of the flowers in different varieties. The Floral Committee examined the plants on June 8, 1917, when all were in flower and made the following recommendations for awards:

Highly Commended (XXX).

- No. 17. Bobs, sent by Mr. Notcutt.
- 20. Felix, sent by Mr. Notcutt.
- 48. Orange Globe, sent by Messrs. R. Veitch.
- 52. Royal Scarlet, sent by Messrs. Barr.
- 35. Cerise Beauty, sent by Messrs. Barr.
- 33. V. L. Harkness, sent by Messrs. Harkness.
- 67. Boadicea, sent by Messrs. Barr.
- 59. Hesperia, sent by Messrs. Bunyard.

Commended (XX).

- 7. Fürstenkind, sent by Messrs. Bunyard.
- 44. Silverblick, sent by Mr. Notcutt.

Of these none had previously received an award, but the following represented in the trial had received Awards in years past, although now passed over: No. 6, Blush Queen (**F.C.C.** 1888, Ware); Nos. 13, 15, Jennie Mawson (**A.M.** 1907, Mawson); No. 21, Lady Roscoe (**A.M.** 1903, Notcutt); Nos. 22, 23, Princess Ena (**A.M.** 1907, Perry); Nos. 24, 25, Queen Alexandra (**A.M.** 1906, Perry); Nos. 26, 27, Mrs. Perry (**A.M.** 1906, Perry); Nos. 46, 47, Mrs. Marsh (**A.M.** 1901, Perry).

VARIETIES.*

- | | |
|----------------------------|-----------------------|
| 1. Muriel Russell. | 2. Black & White. |
| 1A. C. J. van Bourgondieu. | 2A. Silvery Moon. |
| 1B. Madge Knowles. | 3. Elsie G. Harkness. |

* Varieties grown for trial in the Wisley Gardens are known by number only until the judging is completed.

- | | |
|-------------------------------|--------------------------|
| 4. Blush Queen or Marguerite. | 41. } R. C. Notcutt. |
| 5. Psyche. | 42. } |
| 6. Blush Queen. | 43. Star of Devon. |
| 7. Fürstenkind. | 44. Silberblick. |
| 8. Princess of Wales. | 45. Dod's Hybrid. |
| 9. Freak. | 46. } |
| 10. Mrs. Peacock. | 47. } Mrs. Marsh. |
| 11. } | 48. Orange Globe. |
| 12. } Marie Studholme. | 49. Australia. |
| 13. } | 50. Grenadier. |
| 14. } Jennie Mawson. | 51. Rembrandt. |
| 15. } | 52. Royal Scarlet. |
| 16. Princess Victoria Louise. | 53. } |
| 17. Bobs. | 54. } Grenadier. |
| 18. Mrs. John Harkness. | 55. Glendica. |
| 19. Magnate. | 56. Taplow Scarlet. |
| 20. Felix. | 57. Goliath. |
| 21. Lady Roscoe. | 58. Magnificent. |
| 22. } | 59. Hesperia. |
| 23. } Princess Ena. | 60. Duke of Teck. |
| 24. } | 61. Waterloo. |
| 25. } Queen Alexandra. | 62. } |
| 26. } | 63. } Oriental King. |
| 27. } Mrs. Perry. | 64. Crimson King. |
| 28. Barbara. | 65. Livermere. |
| 29. } | 66. Beauty of Livermere. |
| 30. } Rose Queen. | 66A. Monarch. |
| 31. Mrs. Perry. | 67. Boadicea. |
| 32. Mrs. J. Harkness. | 68. Phyllis. |
| 33. V. L. Harkness. | 69. Sandringham. |
| 34. La Reine des Cerises. | 70. Winnie. |
| 35. Cerise Beauty. | 71. Aunt Chloe. |
| 36. Joyce. | 72. Harmony. |
| 37. Leviathan. | 73. Marquis. |
| 38. } | 74. Madge. |
| 39. } Autocrat. | 75. Mahony. |
| 40. Doris. | 76. Devonia. |

DESCRIPTIONS.

Creamy White.

2. Black and White (Harkness).—Height 2 feet 8 inches; flower 6 inches; white with large black purple blotch; flowering from May 29.

2A. Silvery Moon (Harkness).—Height 2 feet 8 inches; flower 5 to 6 inches, white, black purple blotch, red at base; flowering from May 29. Similar to No. 2 but blotch smaller.

1A. C. J. van Bourgondieu (Harkness).—Height 3 feet; flower 6 inches, white, purple blotch; flowering from June 4.

1B. Madge Knowles (Harkness).—Height 2 feet 8 inches; flower 6 inches, white, purple blotch. Similar to 1A.

1. Muriel Russell (Harkness).—Height 2 feet 6 inches; flower 4 inches, white, black purple blotch; flowering June 1.

White with Pink Flush.

3. Elsie G. Harkness (Harkness), XXX June 8, 1917.—Height 2 feet 9 inches; flower 5 inches, very pale pink with purple blotch, reddish at base; flowering from May 29.

Mauve White.

4. Blush Queen or Marguerite (Bunyard).—Height 2 feet 8 inches; flower 4½ inches, mauvy white, faint purple streak in centre; flowering from May 29. Paler than No. 6 and almost without spot.

Pale Blush Pink.

6. Blush Queen (Notcutt).—Height 3 feet 6 inches; flower 5 inches, pale bluish pink, dark purple streaked blotch; flowering from May 16.

5. Psyche (Notcutt).—Height 3 feet 6 inches; flower 5 inches, pale bluish pink, small dark purple streaked blotch, a little darker than No. 6; flowering from May 16.

19. Magnate (Wallace).—Height 3 feet; flower 4½ inches, dull papery pink, faintly streaked darker, black purple streaked blotch; flowering from June 5. Only one plant flowered.

Pinkish Mauve.

8. Princess of Wales (Barr).—Height 2 feet 10 inches; flower 5 to 6 inches, mauve pink, black purple blotch, streaked reddish purple base; flowering from May 29.

29, 30. Rose Queen (Notcutt, Wallace), No. 30 XXX June 8, 1917.—Height 3 feet 8 inches; flower 6 inches, pinkish mauve with streaked purple blotch; flowering from June 4.

Deep Pink.

7. Fürstenkind (Bunyard).—Height 3 feet 9 inches; flower 6 inches, deep pink with large dark purple blotch; flowering from June 6.

Salmon Pink.

17. Bobs (Notcutt), XXX June 8, 1917.—Height 3 feet; flower 4½ inches, no bracts, flesh pink, dark purple streaked blotch; flowering from June 6.

20. Felix (Notcutt), XXX June 8, 1917.—Height 2 feet 8 inches; flower 4 to 4½ inches, pink, deeper than No. 26, black purple blotch; flowering from May 29.

9. Freak (Harkness).—Height 3 feet 6 inches; flower 7 inches, petals deeply cut, deep salmon pink, large black purple blotch; flowering from June 8.

13, 14, 15. Jennie Mawson (Simpson, Wallace, Barr).—Height 2 feet 4 inches; flower 6 inches, light flesh pink, streaked black purple blotch; flowering from June 4. No. 14 failed, and Nos. 13 and 15 did badly and were consequently dwarf.

21. Lady Roscoe (Notcutt).—Height 2 feet 8 inches; flower 4½ to 5 inches; bracts none, bright salmon pink; flowering from May 29.

11, 12. Marie Studholme (Simpson, Wallace).—Height 2 feet 9 inches to 3 feet; flower 5 inches, salmon, small purple spot; flowering from June 1.

18, 32. Mrs. John Harkness (Harkness, Simpson), No. 32 XXX June 8, 1917.—Height 3 feet to 3 feet 8 inches; flower 4½ to 6 inches, petals slightly notched, deep salmon pink, black purple blotch; flowering from May 29. In No. 18 the petals were finely or coarsely notched and the flower was paler.

10. Mrs. Peacock (Harkness).—Height 3 feet; flower 4½ inches, bracts none, deep salmon pink, large black purple blotch; flowering from May 30.

26, 27, 31. Mrs. Perry (Barr, Notcutt, Simpson), No. 26 XXX June 8, 1917.—Height 3 feet 6 inches; flower 4 to 6 inches, deep flesh pink with small black purple blotch; flowering from May 29.

22, 23. Princess Ena (Notcutt, Wallace).—Height 3 feet 6 inches; some petals slightly notched; flower 4 inches, salmon pink, some with faint purplish streak; flowering from May 29.

16. Princess Victoria Louise (Wallace).—Height 3 feet; flower 3½ to 4 inches, light flesh pink, black purple streaked blotch; flowering from May 30.

24, 25. Queen Alexandra (Barr, Notcutt).—Height 3 feet 6 inches; flower 4 to 5 inches, pink, deeper than No. 26, small black purple streaked blotch; flowering from May 29. No. 25 had one plant rather deeper in colour.

41, 42. R. C. Notcutt (Barr, Notcutt).—Height 3 feet 3 inches to 3 feet 9 inches; flower 5 inches, salmon pink with purple black streaked blotch; flowering from June 10.

43. Star of Devon (Godfrey).—Height 4 feet; flower 5½ inches, deep salmon, dark purple blotch; flowering from June 4.

Orange Red.

49. Australia (Barr).—Height 3 feet 8 inches; flower 5 to 5½ inches, bracts none, bright vermillion, black purple streaked blotch; flowering from June 14.

50, 53, 54. Grenadier (Godfrey, Bunyard, Barr).—Height 3 feet 8 inches to 4 feet; flower 5 to 6 inches, brilliant orange scarlet, black streaked blotch,

petals shining; flowering from June 1. No. 50 was lighter in colour with petals of a paper texture, and No. 53 had no bracts and came into flower a week earlier.

48. Orange Globe (R. Veitch), **XXX** June 8, 1917.—Height 3 feet 4 inches; bracts small; flower 4 to 5 inches, orange red, purple blotch; flowering from May 22.

52. Royal Scarlet (Barr), **XXX** June 8, 1917.—Height 3 feet to 4 feet; bracts none; flower 6 inches, deep orange, black purple blotch; flowering from June 4.

Cerise.

35. Cerise Beauty (Barr), **XXX** June 8, 1917.—Height 3 feet 6 inches; flower 5 inches, light scarlet lake deeper at base, black purple streaked blotch; flowering from June 6.

36. Joyce (Barr).—Height 3 feet 8 inches; flower 4½ inches, scarlet lake, black purple blotch; flowering from May 29.

34. La Reine des Cerises (Bartleet).—Height 3 feet 9 inches; flower 5 inches, scarlet lake, small black purple streaked blotch; flowering from June 6. Only one plant.

33. V. L. Harkness (Harkness), **XXX** June 8, 1917.—Height 4 feet; flower 7 to 8 inches, brilliant scarlet lake, with black streaked blotch; flowering from June 8.

44. Silberblick (Notcutt), **XX** June 8, 1917.—Height 3 feet 8 inches; flower 5 inches, petals four, silvery scarlet with silvery spot at base, white filaments; flowering from May 22.

Scarlet.

45. Dod's Hybrid (Wallace).—Height 2 feet 9 inches; flower 3½ to 4 inches, without bracts, petals four, buff scarlet; flowering from June 1. One plant with slender peduncles, flower thin in texture, stamens bluish.

51. Rembrandt (Bunyard).—Height 4 feet; bracts none; flower 6 inches; bright vermilion, black purple blotch; flowering from June 5.

55. Glendica (Bunyard).—Height 3 feet 9 inches; bracts none; flower 5 to 6 inches, bright scarlet with black blotch, blue spots fading to white; flowering from May 22.

56. Taplow Scarlet (Barr), **XXX** June 8, 1917.—Height 3 feet 8 inches; flower 7 inches, scarlet, black purple blotch; flowering from May 29.

57. Goliath (Barr).—Height 4 feet; flower 7 inches, scarlet, black blotch forming blunt-pointed star; flowering from May 29. Almost identical with No. 56.

58. Magnificent (Barr).—Height 3 feet 6 inches; flower 6 inches, scarlet, with very large black purple blotch; flowering from June 4.

46, 47. Mrs. Marsh (Wallace, Notcutt).—Height 3 feet to 3 feet 8 inches; flower 4 to 7 inches, bracts none, scarlet, black purple blotch; flowering from May 29. No white flakes, which are said to be typical of this, are present in the flowers.

61. Waterloo (Wallace).—Height 4 feet; bracts none; flower 5 inches, scarlet, with black purple streaked blotch; flowering from June 1.

60. Duke of Teck (Barr).—Height 4 feet; flower 4 inches, scarlet, black purple blotch; flowering from June 5.

62, 63. Oriental King (Harkness, Simpson).—Height 2 feet 8 inches to 3 feet; bracts none; flower 5½ to 6 inches, scarlet, black purple streaked blotch; flowering from June 4. Buds very round. Lighter than No. 64.

Crimson Scarlet.

65, 66. Beauty of Livermere (Simpson, Wallace), **XXX** June 8, 1917.—Height 4 feet 6 inches; flower 7 inches, deep scarlet, black streaked blotch, petals wavy; flowering from June 1.

67. Boadicea (Barr), **XXX** June 8, 1917.—Height 4 feet 6 inches; flower 6 inches, scarlet, black blotch forming blunt-pointed star; flowering from May 30. Not quite so deep as No. 66.

64. Crimson King (Barr).—Height 3 feet 8 inches; flower 5 inches, brilliant scarlet, black blotch, streaked outside; flowering from May 25. Mixed, one lighter in colour and with smaller flowers. Slightly paler than No. 67.

59. Hesperia (Bunyard), **XXX** June 8, 1917.—Height 4 feet; flower 6 inches, petals wavy, scarlet, small black streaked blotch; flowering from May 29.

Rosy Mauve.

38, 39. Autocrat (Godfrey, Wallace).—Height 3 feet 6 inches to 3 feet 9 inches; flower 5 to 6 inches, very deep rosy mauve, large black streaked blotch; flowering from May 29.

37. Leviathan (Godfrey).—Height 3 feet 6 inches; flower 6 inches, rosy mauve, small black purple streaked blotch; flowering from May 29;

Rosy Claret.

69. Sandringham (Godfrey).—Height 3 feet; flower 6 inches, rosy claret, lighter margin, black purple streaked blotch; flowering from May 30.

71. Aunt Chloe (Wallace).—Height 3 feet; flower 6 inches, wine colour, black purple streaked blotch; flowering from June 1. Rather larger flower than No. 69.

72. Harmony (Wallace).—Height 3 feet 6 inches; flower 5 inches, purplish, black purple blotch; flowering from May 29.

70. Winnie (Wallace).—Height 3 to 4 feet; flower 5 inches, rosy claret, black purple streaked blotch; flowering from June 1. Rather darker than No. 69.

68. Phyllis (Godfrey).—Height 4 feet 6 inches; flower 5 to 5½ inches, crimson lake, black purple blotch; flowering from June 4. Still darker than No. 69.

Purplish Old Rose.

73. Marquis (Wallace).—Height 2 feet 9 inches; flower 4 inches, purplish old rose, black purple blotch; flowering from June 10.

74. Madge (Godfrey).—Height 3 feet; flower 5 inches; purplish old rose, black purple streaked blotch; flowering from June 1. Mixed, one plant of 'Winnie.'

40. Doris (Wallace).—Identical with No. 74.

Carmine.

66A. Monarch (Godfrey).—Height 4 feet; flower 5½ inches; carmine with small black blotch; flowering from June 2.

Dark Maroon.

76. Devonian (R. Veitch).—Height 3 feet 9 inches; flower 5½ inches; dark maroon with large black blotch; flowering from May 29.

75X. Mahony (Simpson).—Height 4 feet; flower 4½ inches, dark maroon, almost without blotch; flowering from June 1. Mixed, one plant of 'Queen Alexandra.'

BRUSSELS SPROUTS AT WISLEY, 1918.

THE seed of the Brussels Sprouts was sown (except that of Nos. 63 and 64) in gentle heat on February 25, 1918; the plants were pricked out into cold frames on March 15, and after hardening off were planted out in their permanent quarters on May 13. The ground had been occupied in 1917 by late peas, and after clearing was manured with stable manure, and dug during the winter, being left rough on the surface until April when it was forked over. So treated practically all varieties produced firm sprouts, whether of large or small size, making the selection of the best no easy task. Of the sixty-four stocks sent for trial one or two noted below were mixed, and a few contained bolters, but most produced good crops of excellent sprouts.

Nos. 63 and 64 were sent in as plants, having been raised in autumn and wintered before we received them. There was no great difference between these and the corresponding plants raised at Wisley as above from the same stock seed.

The Fruit and Vegetable Committee examined the trial on November 15, 1918, and made the following recommendations:—

Award of Merit.

- 12. Dundee, introduced and sent by Messrs. Barr.
- 61. Favourite, introduced and sent by Messrs. Artingstall.

Highly Commended.

- 10. Dalkeith, sent by Messrs. Scarlett.
- 26. Holborn Exhibition, raised and sent by Messrs. Carter.
- [E] 40. Rosny, sent by Messrs. Barr.

Commended.

- 2. Aigburth Giant, sent by Messrs. R. Veitch.
- 29. King of the Market, sent by Messrs. Barr.
- 38. Perfection, raised and sent by Messrs. E. W. King.
- 64. Darlington, raised by Messrs. Kent and Brydon, sent by Messrs. Scarlett.

No variety of Brussels Sprouts under either of the above names has hitherto received an award, but "Certificates of Merit" were given to 'Paris Market' among the small varieties, and to 'Large Wroxton' among the large when exhibited at the Vegetable Conference at Chiswick in September 1889; both were represented in the present trials.

DESCRIPTIONS AND NOTES.

TALL VARIETIES (over 24 inches).

- 2*. AIGBURTH GIANT (R. Veitch), XXX Nov. 15, 1918.—24 to 28 inches; sprouts of medium to large size. Early.
1. AIGBURTH (Carter).—Like No. 2, but dwarfer, showing some variation in colour, sprouts smaller. Crop rather less.
- 3, 60. CAMBRIDGESHIRE CHAMPION (Barr, Gray) } —24 to 30 inches; foliage
4. CLARKE'S SELECTED (Barr) } large, spreading; sprouts large. Early.
5. CLIMAX (Yates).—18 to 32 inches; foliage medium; sprouts medium to large. Later. Stands well. Variable in height.
- 6, 7, 8. COVENT GARDEN (Hurst, Sydenham, Barr).—24 to 36 inches; foliage large; sprouts large. Stocks uneven.
10. DALKEITH (Scarlett), XXX Nov. 15, 1918.—24 to 32 inches; foliage very large; sprouts large. Much grown in Midlothian. Early.
- 9, 63. DALKEITH (Barr, Scarlett).—Like 10. No. 63 received as plants but gave much smaller crop.
64. DARLINGTON (Scarlett), XX Nov. 15, 1918.—24 to 30 inches; foliage large to very large; sprouts large. Later. Received as plants.
- 11, 51. DARLINGTON (Scarlett, Barr).—Similar to 64.
12. DUNDEE (Barr), A.M. Nov. 15, 1918.—24 to 30 inches; foliage medium to large; sprouts medium to large.
20. EXHIBITION (Dickson and Robinson).—18 to 30 inches; foliage medium to large; light green; sprouts small to medium. Later. Stood well. Irregular as to height.
- 21, 22. EXHIBITION (Barr, R. Veitch).—18 to 30 inches; foliage of medium size; sprouts medium. Uneven in height.
38. PERFECTION (E. W. King), XX Nov. 15, 1918.—24 to 36 inches; foliage large; sprouts large. Later. A heavy cropper.
37. PERFECTION (Carter).—Similar to No. 38 but less leafy and vigorous, and giving a much smaller crop.
39. PRESIDENT CARNOT (Barr).—24 to 30 inches; foliage large, medium green; sprouts large.
40. ROSNY (Barr), XXX Nov. 15, 1918.—24 to 30 inches; leaves small to medium, very dark green; sprouts large. Later. Very distinct in colour.
49. TALL FRENCH (Barr) } —24 to 36 inches; leaves large to very large;
50. THE BULLET (Barr) } sprouts large. Rather late. Standing well.
- 52, 53, 54, 55. WROXTON (Sydenham, Watkins and Simpson, R. Veitch, Barr).—24 to 27 inches; foliage of medium size; sprouts large. No. 53 was a more regular stock than others. Nos. 52, 54, 55 varied much in height, and Nos. 54 and 55 in other ways as well.
57. EVESHAM SPECIAL (Watkin and Simpson).—24 to 36 inches; foliage very large; sprouts large. Plants variable in cropping.
58. PYRAMID (Gray).—Slightly dwarfer than 57, with rather smaller leaves. Early. Crop small.
59. BEDFORDSHIRE GIANT (Gray).—24 to 30 inches; foliage very large; sprouts large. Early.
61. FAVOURITE (Artingstall), A.M. Nov. 15, 1918.—24 to 30 inches; foliage large but not very spreading, dark green; sprouts medium to large. Early. A very regular stock.
62. SELECTED (Dobbie).—24 to 36 inches; foliage and sprouts large. Early.
42. SCRYMGER'S GIANT (Barr).—20 to 30 inches; foliage very large, medium to dark green; sprouts medium to large. Medium late.
43. SKIRBECK FAVOURITE (Barr).—A very mixed stock.

DWARFER VARIETIES (up to 2 feet).

13. DELICATESSE (Barr).—18 to 24 inches; foliage medium to very large, dark green; sprouts large.
14. DWARF ERFURT (Barr).—18 to 20 inches; foliage medium size, dark green; sprouts of medium size.

* See footnote, p. 120.

15. DWARF GEM (Sutton).—16 to 24 inches; foliage rather more spreading than No. 14; sprouts small to medium. Early.

16. DWARF GEM (Sydenham).—Similar to No. 15.

17. IMPROVED DWARF (Carter).—Stock somewhat mixed, otherwise like Nos. 15 and 16.

18, 19. EXHIBITION (Barr, Sutton).—18 to 24 inches; foliage of medium size, lighter green; sprouts small to medium. Fairly early. No. 19 (Messrs. Sutton's) was the truer stock.

23. FAVOURITE (Sydenham).—15 to 20 inches; foliage of medium size, light green; sprouts small to medium.

24. HOWCROFT'S GIANT (Barr).—16 to 24 inches; foliage of medium size, light green; sprouts small to medium. Later. Producing a heavy crop.

25. HERCULES (Hancock).—15 to 20 inches; foliage of medium size; sprouts small to medium. Later. A rather variable stock. Raised by sender, 1915. 'Sharpe's Standard' (No. 48) × 'Dwarf Gem' (No. 15).

26. HOLBORN EXHIBITION (Carter), XXX Nov. 5, 1918.—18 to 24 inches; foliage of medium size, light green; sprouts small to medium. Later. Producing a very heavy crop. A good regular stock.

27, 28. IDEAL (Barr, Dickson, Brown & Tait).—15 to 18 inches; foliage of medium size; sprouts small to medium. Later. Raised by Mr. Taylor of Byram Park Gardens, introduced by Messrs. Dickson, Brown & Tait.

29. KING OF THE MARKET (Barr), XX Nov. 15, 1918.—18 to 24 inches; leaves medium to large, light green; sprouts small to medium. Early. A heavy cropper.

30. KING OF THE MARKET (R. Veitch).—A less regular stock of No. 29, taller and later.

31. LITTLE GEM (Barr).—18 to 24 inches; foliage and sprouts medium size. Later.

32. MARKET FAVOURITE (Sutton).—18 to 24 inches; foliage and sprouts of medium to large size. Early. A good cropper.

33, 34. MATCHLESS (Barr, Sutton).—18 to 24 inches; leaves and sprouts of medium to large size. Early. Raised by Messrs. Sutton.

35. SELECT OFFENHAM (Yates).—24 to 30 inches; foliage medium to large; sprouts large. Early.

36. PARIS MARKET (Barr).—18 to 24 inches; foliage medium to large; sprouts medium to large. A heavy cropper, but stock mixed.

44, 45, 46. SOLIDITY (Barr, Alexander & Brown, Holmes).—20 to 24 inches; leaves medium to large, light green; sprouts medium to large. Early. Raised by Mr. Harper of Tullibardine Gardens.

47. STANDARD (Barr).—18 to 24 inches; leaves of medium size, very dark green; sprouts small to medium. Late.

48. STANDARD (SHARPE'S) (Barr).—A mixed stock.

56. EVESHAM SPECIAL (Barr).—18 to 24 inches; leaves medium to large; sprouts large.

41. ST. FORT (Staward).—18 to 24 inches; foliage very large, medium to dark green; sprouts medium to large; Late. Raised by sender between 'Dalkeith' (No. 10) and 'Dwarf Gem' (No. 15).

CARROTS AT WISLEY, 1918.

SIXTY-ONE stocks of carrot were sent for trial in 1918. They were sown on ground occupied by onions in the previous year, followed by a crop of mustard dug in in autumn. The first sowing of all the stocks was made on April 24, and the crop was thinned to 4 inches or 6 inches, according to the variety on June 11. The plants looked very promising until June 20, when carrot fly attack made itself very evident, especially on the short-rooted varieties. A second sowing was accordingly made on June 25, thinning being done on July 23. This sowing escaped the fly entirely. The germination of Nos. 27, 28, 50, and 57 was poor, and of Nos. 17, 45, 46, 47, 49, and 52 only fair, the remainder germinated well. The crops were examined by the Fruit and Vegetable Committee in August and November, and the following awards were made :

Highly Commended.

No. 4. Early Frame, sent by Messrs. Barr, introduced by Messrs. Watkins & Simpson.

12. Early Queen, sent by Messrs. Barr, said to be of French origin.

52. New Intermediate, sent by the introducers, Messrs. R. Veitch.*

Commended.

16. Champion Horn, sent by introducers, Messrs. Sutton.

54. Improved Long Red Surrey, sent by introducers, Messrs. Sutton.

44. New Scarlet Intermediate, sent by Messrs. Sydenham.

49. Perfection, sent by introducers, Messrs. Dickson & Robinson.

Special attention may be directed to the forms mentioned below with small tops since they take such small space in the garden.

DESCRIPTIONS AND NOTES.

I. ROOTS YELLOW.

60. LONG YELLOW STUMP-ROOTED (Barr) } —These were both taper-rooted
61. LONG LEMON (Barr) } varieties about 7 to 10 inches long and 2 to 2½ inches diameter, with a small yellow core. Foliage large.

II. ROOTS RED.

A. ROOTS ALMOST ROUND, 2 TO 2½ INCHES LONG AND WIDE.

1. *Foliage small and sparse.*

1. INIMITABLE FORCING (Sutton).—Stock contained some bolters.

2. EARLIEST FRENCH SHORT HORN (Barr).

3. FRENCH FORCING HORN (R. Veitch).

4. EARLY FRAME (Barr).—H.C., Aug. 22, 1918.

* This variety received A.M. in 1903 when sent by Messrs. R. Veitch.

2. *Foliage larger.*

- 5. LITTLE GEM (Dickson & Robinson).—Roots not quite uniform.
- 6. PARISIAN FORCING (Barr).—Contained some of "Intermediate" type.
- 7. EARLY GEM (Sutton).—Roots not quite uniform.

B. ROOTS SLIGHTLY LONGER THAN WIDE, 3 TO 4½ INCHES LONG,
2 TO 2½ INCHES WIDE.

1. *Foliage small, sparse.*

- 12. EARLY QUEEN (Barr).—H.C., Nov. 15, 1918.

2. *Foliage medium.*

- 8. BELLOT SHORT RED FORCING (Barr).—Roots not uniform in shape.
- 9. EARLY RED DUTCH (Barr).—Roots not uniform. Some of "Intermediate" type, and yellow.
- 10. DUTCH HORN (Barr).—Contained some "Intermediate" yellow roots.
- 13. EARLY SHORT HORN (Barr).
- 14. EARLY HORN (Sutton).—Contained one bolter.

3. *Foliage large.*

- 11. EARLY GUERANDE (Barr).—Stock mixed.
- 23. HALF-LONG SCARLET METZ (Barr).—Mixed, contained some long yellow.
- 36. MATCHLESS (Dickson & Robinson).—Roots not uniform, some short, some half-long.
- 58. SCARLET PERFECTION (Dobbie).—A little larger than others. No core.

C. ROOTS TOP-SHAPED, 4 TO 6 INCHES LONG, 2½ TO 3 INCHES WIDE.

1. *Foliage large.*

- 22. SUMMER FAVOURITE (Carter).

C. ROOTS CYLINDRICAL (STUMP), 4 TO 6 INCHES.

1. *Foliage small and sparse.*

- 16. CHAMPION HORN (Sutton).—C., Nov. 15, 1918. Core small.

2. *Foliage of medium size.*

- 15. IMPROVED EARLY HORN (Carter).—Roots not uniform, some shorter, as in previous class.
- 20, 21. PRIMO (Watkins & Simpson, Barr).
- 34. STUMP-ROOTED (Dobbie).—Thicker roots than foregoing. Foliage dwarf.
- 35. STUMP-ROOTED, HALF-LONG SCARLET (Barr).—Roots as in 34. Tops rather variable.
- 38. CARENTAN (Barr).

3. *Foliage large.*

- 17. SCARLET MODEL (R. Veitch).—Some roots forked.
- 18. EARLY SCARLET, NANTES (Sydenham).
- 24, 25. FAVOURITE (Sutton, Barr).—Roots somewhat variable in shape.
- 26, 27. EARLY MARKET (Watkins & Simpson, Barr).
- 29. HALF-LONG LUC (Barr).—One bolter. Roots not uniform, some yellow.
- 30, 31. DANVERS HALF-LONG (Thorburn, Barr).—Perhaps better in next section.
- 33. STUMP-ROOTED SCARLET (Barr).
- 37. MONUMENT (Barr).
- 39. INTERMEDIATE SCARLET STUMP-ROOTED (Barr).—Foliage very strong.

D. ROOTS CYLINDRICAL (STUMP), LONGER THAN C.

1. *Foliage medium.*

- 50. LONG KEEPER (Barr).—6 to 10 inches, almost without core.
- 51. SANS CŒUR (Barr).—7 inches, 2½ wide, without core.

2. *Foliage large.*

19, 28. EARLY NANTES HORN (R. Veitch, Barr).

32. CHANTENAY (Barr).

E. ROOTS INTERMEDIATE IN LENGTH, TAPERING.

40. RED INTERMEDIATE (Carter).—One bolted.

41. NEW RED INTERMEDIATE (Sutton).—Of a deep red colour.

42. INTERMEDIATE (Dobbie).

43. SCARLET INTERMEDIATE (Sutton).

44. NEW SCARLET INTERMEDIATE (Sydenham).—C., Nov. 22, 1918.

45. 47. JAMES' INTERMEDIATE (Watkins & Simpson, Barr).—One bolted in each stock.

46. JAMES' SCARLET INTERMEDIATE (R. Veitch).—Roots varied in shape, some being of "horn" type.

48. NEW INTERMEDIATE (Barr).—A very mixed stock.

52. NEW INTERMEDIATE (Veitch).—H.C., Nov. 22, 1918.

F. ROOTS LONG AND TAPERING.

49. PERFECTION (Dickson & Robinson).—One bolted.

53. LONG SURREY (Barr).—A poor stock.

54. IMPROVED LONG RED SURREY (Sutton).—C., Nov. 22, 1919. Brick red.

55. 56. ALTRINCHAM (Dobbie, R. Veitch).—Both stocks contained bolters. Deep red.

57. LONG BLOOD-RED (Barr).—Purplish red. Stock mixed with yellow rogues.

59. SCARLET PERFECTION (Carter).—Rather variable in colour. Mainly orange red.

BOOK REVIEWS.

"British Grasses and their Employment in Agriculture." By S. F. Armstrong. 8vo. viii + 199 pp. (University Press, Cambridge, 1917.) 6s. net.

Grasses are of such enormous value on the farm and in such demand where lawns are to be made and maintained, that a really good book dealing adequately with them is bound to find a place near to the hand of the farmer and the gardener. Nothing quite so good as this for their purposes has appeared in English, and whether we test it for its botanical accuracy, the value of the numerous (mostly original) drawings and photographs that illustrate it, or the information on the characteristics of growth which the farmer and gardener need to take into account, we find it full, clear, and exact. Considerable space is given up to the description of the seed, and to statistics concerning purity and capacity for germination as well as to notes upon the nature of the impurities that may be expected to occur in different samples. Altogether it is a book which should be in the hands of everyone whose interest and business it may be to deal with British grasses in any way.

"Late Cabbage." By E. N. Reed. 8vo. xiii + 131 pp. (Chapman and Hall, London, 1917.) 6s. net.

A treatise on the cultivation of such a common field crop for one particular season is somewhat of a novelty in market-gardening, but the treatment meted out to the subject amply justifies the innovation. No cultivator of cabbages can afford to neglect, if he wishes for full crops, the thorough working of the soil which the writer advocates, for upon it depends not only the constant supply of water necessary for the well-being of the plants throughout their lives, but also the equally important fact that there need then be no delay in transplanting at the proper time. Every experienced grower knows that delay at the early end of the season means failure to produce hard and heavy heads at harvest, just as every grower knows that too great space may lead to the production of heads too large for the market. The times and the seasons as well as the diction are more familiar to the Americans than to the English grower, but the principle enunciated and the main lessons taught are the same for England as America.

The following is typical of the diction: "What is the best method to follow when transplanting cabbage? The time used to be when hand-setting was thought best, but that time has long gone by. Perhaps quite a portion of the growers are using two-horse machines." The author then goes on to describe these machines and their drawbacks, comparing them in cost with the "Masters' Hand Planter" to the praise of the latter both for economy and efficiency; and he finally says "It seems as if there are a few facts stated here that every thinking man would grasp" (pp. 52-58).

The various pests which attack the cabbage are described and appropriate methods of dealing with them detailed.

The saving of cabbage seed is also described and the necessary precautions outlined.

"Grapes, and How to Grow Them." By J. Landsell. Ed. 3. Edited by T. W. Sanders. Ed. 3. 8vo. 114 pp. (Collingridge, London, 1919.) 3s. 6d. net.

Amateurs who possess only one greenhouse, and others with larger accommodation, often inquire for a practical book on Vines and their management, which is not too expensive for limited means; and in this book they will find all the information they are likely to need. The chapter dealing with Vines in Greenhouses in which other plants are growing as well is particularly valuable for the amateur; and the other chapters are excellent for all grape-growers, and well worthy of close attention.

"Vegetable Gardening." By J. S. Chisholm. 8vo. 126 pp. (Jack, London, 1919.) 1s. 3d. net.

When we say this excellent little book was written by Mr. Chisholm, the Senior Lecturer in Horticulture, Edinburgh, and East of Scotland College of Agriculture, some idea may be formed of its practical and exceedingly valuable

scope. It has the great merit, too, of being of reasonable price, putting it within the reach of all. The opening chapter on soil management will be especially useful to allotment holders, and to others with more extensive gardens, showing how best to carry out cultivation, economically and efficiently.

"The Strawberry in North America." By S. W. Fletcher, 8vo. 234 pp. (Macmillan, London, 1917.) 8s. net.

The British fruit-grower will find this work by Mr. Fletcher, Professor of Horticulture at the Pennsylvania State College, full of most valuable information from beginning to end, and containing matter of considerable interest to the Strawberry growers in this country. It appears that the cultivation of Strawberries in America was in its infancy about 1800; now the quantity grown for market is enormous, and the varieties almost countless, many of them raised by careful hybridization, the origin of the best being recorded. Some of these varieties have spread all over Europe. The pecuniary reward in Strawberry breeding does not appear to be large. The author says "some men raise thousands of seedlings without producing one that they consider worthy of introduction." The early history of the North American type and its origin is full of excellent matter, and the beginning of garden and commercial cultivation is also dealt with. The introduction of a variety which was highly esteemed in Britain, viz., Keen's Seedling, many years ago, and then found in every garden, will be remembered by most of the old school; it was one of the parents of our present well-known and popular varieties.

Breeding for a specific purpose is one of the subjects dealt with in a clear and desirable manner that should enable the breeder to avoid many pitfalls. However, soil, situation, and other conditions have such an influence on Strawberries, that one that is first-class in one place may be worthless in another, as proved not only in this country, but also in America. We heartily commend this book to all interested in this popular fruit. It is boldly printed, nicely illustrated, capably indexed, and of handy size.

"Botany: A Text-Book for Senior Students." By D. Thoday. Ed. 2. 8vo. xix + 524 pp. (University Press, Cambridge, 1919.) 7s. 6d. net.

We noticed the first edition of this useful book when it first appeared (see JOURNAL R.H.S. xli. p. 481), and now need only to say that chapters dealing with the cryptogams have been added so as to make the volume a still more useful one to a wider range of students.

"Botany: The Modern Study of Plants." By M. Stopes. 125 pp. New Issue.

"The Evolution of Living Organisms." By E. S. Goodrich. 125 pp. New Issue. (Nelson, London, 1919.) 1s. 3d. each net.

These new issues of "The People's Books" are both improvements upon good little books, revised and brought up to date by the addition of new matter. They were noticed when they first appeared. (See JOURNAL R.H.S. xxxviii. pp. 586, 594.)

"An Introduction to the Study of Plants." By F. E. Fritsch and E. J. Salisbury. Ed. 2. 8vo. viii + 397 pp. (Bell, London, 1917.) 5s. net.

Many elementary text-books of botany in the past have paid too great attention to the explanation of terms, so that some have seemed little more than a running commentary upon the words peculiar to descriptive botany. Others appear to inculcate the idea that the end of botanical science is to enable one to "run down" a plant. A few introduce chapters upon plant physiology.

Latterly a new, and as we believe, better and more logical spirit has come over botanical teaching, so that the central idea is the plant and its mode of life with inquiry by observation and experiment into the means by which nutrition, growth, and reproduction are effected in the different circumstances in which plants grow. No elementary book we have seen carries out this idea so well as the present one, and we can therefore most heartily recommend it to the beginner in botanical study. It is an innovation in botanical text-books to find a chapter devoted to a consideration of the soil, and an innovation almost as revolutionary in conception as it is good in execution.

The usual features of an elementary botanical text-book are of course present, and in addition to the chapter mentioned above an excellent elementary account of the vegetation of typical habitats in England, such as woodlands, sand dunes, rocks, and so on, making an admirable introduction to the subject of plant ecology.

"Soil Biology: Laboratory Manual." By A. L. Whiting, Ph.D. 8vo. ix + 143 pp. (Chapman & Hall, London, 1917.) 6s. net.

Soil Chemistry and, to a certain extent, Soil Physics have long since found their place in school and college courses in Agriculture; but the equally important biological aspect of soil conditions has not only been less studied, but even those parts that are most intimately known have been more or less neglected as subjects of practical study in such courses. This is not as it should be, and it is to be hoped that this little book of practical exercises and questions will help to introduce this side of soil science more to the notice of the teacher and bring it more prominently before those framing courses of instruction for agricultural and horticultural students. The proof of the pudding is in the eating, and until the exercises contained in this little book have been worked through practically and their practicability determined, it is too soon to speak of the merits of the exercises in detail, but at any rate it is plain that the plan of the book is good, and to follow out its exercises cannot fail to be of value to the student.

"The Natural Organic Colouring Matters." By A. G. Perkin and A. E. Everest. 8vo. xxii + 655 pp. (Longmans, Green & Co. London, 1918.) 28s. net.

This volume forms one of the series of Monographs on Industrial Chemistry edited by Sir E. Thorpe. It deals with the natural organic dyestuffs and takes no account of those colouring matters such as chlorophyll, hæmoglobin, and the carotinoids, which possess no real tinctorial properties. It is quite rational to exclude pigments of the latter type, which form a class apart, the inclusion of which in a monograph on Industrial Chemistry would be unwarrantable; but the title of the book is slightly misleading if read literally. The natural organic dyestuffs themselves form a sufficiently big subject, and it is not surprising that the book runs to nearly seven hundred pages.

As is to be expected from authors so well qualified to deal with this subject, a most comprehensive and detailed account of the occurrence, extraction, constitution, properties, and uses of the natural organic dyestuffs is given. Indeed, it is doubtful whether so exhaustive a treatise can truly be described as a monograph in the usually accepted sense of the term at the present time, as applied to members of series of books devoted to special groups of subjects, namely a short, concise (and therefore moderately priced) volume giving the essentials of a subject, and capable of being readily brought up to date and reissued from time to time. A book of the size and price of that under review scarcely answers this description. However, it must not be thought that we quarrel with the subject matter or with its presentation: both are excellent.

The dyestuffs are classified according to the chemical constitution of their main tinctorial constituents. As examples of the scope of the book it may be mentioned that seventy-eight pages are devoted to the anthraquinone group, including madder, cochineal, and kermes; one hundred and ten pages to the γ pyran group of anthocyanin dyestuffs; and fifty-four pages to the indole group, including indigo, woad, and Tyrian purple. A chapter is included on the tannins, which, although not strictly dyestuffs, are of importance in dyeing operations, and a short account is also given of lakes formed from vegetable colouring matters. A list of natural dyestuffs classified according to their botanical origin forms a useful Appendix. A valuable feature is the wealth of scientific and historical references to the original literature.

The text is on the whole clearly written, though the style is awkward at times, and there are a few evidences of inadequate proof correction, such as "exiccator," "unusual great solubility," and "to invariably accompany." These are minor blemishes, and the book can be unhesitatingly recommended as a valuable work of reference to all interested in the chemistry of the natural organic dyestuffs.

"Recent Advances in Organic Chemistry." By Alfred W. Stewart, with an Introduction by J. Norman Collie. Third edition. 8vo. xix + 350 pp. (Longmans, Green & Co. London, 1918.) 14s. net.

The previous editions of Dr. Stewart's well-known book were outstanding examples of his happy faculty of combining lucid exposition with shrewd criticism, in an eminently readable form. This new edition is certainly not inferior to its predecessors in these respects, and is sure of a hearty welcome from all organic and bio-chemists. Research workers will find it most useful in keeping abreast of progress in fields other than their own, while for advanced students its influence in encouraging their critical faculty and in suggesting subjects for research should be invaluable.

It is significant of the healthy reaction in favour of the study of the organic

chemistry of vital products that more than two-thirds of the volume are devoted to substances belonging to this category. Few will disagree with the author in welcoming this return to nature, but we must differ from him when he states that "It is surprising to find how many subjects for research have been unearthed among the substances which go to build up animal and vegetable structures" (p. 2). Subjects for research do not need unearthing in this field, which on the contrary simply bristles with them. It is rather the complexity of most vital products and the intricacy of vital processes which in the past have hindered the prosecution of fruitful research in biochemistry. Indeed, recent triumphs in the synthesis of vital products have been achieved only as a result of the earlier work on the manifold reactions of the simpler carbon compounds. Moreover, it is doubtful whether any real advance will be made in elucidating the mechanism and nature of vital reactions until the physical chemist has won a clearer insight into the properties of colloids, to quote a conspicuous example.

The first chapter is now devoted to a survey of the main lines of research in the present century. The chapters on the terpenes do not differ sensibly from those in the previous edition. The chapter on rubber contains a trenchant criticism of Harries' work and theories, while the large amount of new work on the alkaloids is clearly reviewed in the chapter on these bodies. After a short account of the polypeptides, twenty pages are devoted to Willstätter's researches on chlorophyll, of which a lucid account is given, though the subject is too complex for really satisfactory treatment in so short a space. After a chapter on Willstätter's remarkable researches on the anthocyanins, we come to what is in many ways the most fascinating chapter in the book. This is based largely on a private communication from Prof. Collie, and in it the author shows in detail how the course of the natural syntheses of the various classes of vital products can be formulated in the light of present-day knowledge of organic chemistry. Succeeding chapters deal with the organic chemistry of arsenic and with the structure of triphenyl methyl. Perhaps the least satisfactory chapter is that headed "Other elements which exhibit abnormal valency." The subject is undoubtedly an important one, but the present state of our knowledge scarcely justifies the space devoted to some of the inconclusive work recorded. The author is again at his best in the final chapter, in which he gives an illuminating and suggestive account of the limitations of existing structural formulæ as an expression of the reactions and reactivity of organic substances.

We have found very few errors, and the only one which calls for comment occurs at the top of p. 263, where the need for a reduction at one stage of the reaction has been overlooked. With regard to the choice of subjects, it is suggested that in a subsequent edition an account should be given of recent important work on the structure of the nucleic acids and of the lipins.

Prof. Collie says in his Introduction: "The text-book is rare that stimulates its reader to ask, Why is this so? or How does this connect with what has been read elsewhere?" Dr. Stewart's book undoubtedly falls into this category.

"A Dictionary of Flowering Plants and Ferns." By J. C. Willis, M.A., Sc.D., F.R.S. Ed. 4. 8vo. xii + 712 + lv pp. (University Press, Cambridge, 1919.) 20s. net.

It is with a certain amount of regret that we find this new edition of Dr. Willis' well-known Dictionary does not contain the valuable introductory summary that made the earlier editions something more than a mere dictionary—made them indeed interesting as textbooks dealing with some aspects of botany too often neglected. It is with regret too that we find the serviceable dark blue cover of the earlier replaced by a light blue-grey one in this last edition. These regrets are only not quite turned to whole-hearted approbation when we investigate the contents of the Dictionary itself and find that all the genera of flowering plants are noted, and the book is thus much more complete than in the earlier editions where only the principal ones found a place. The style of the book is too well known to need description, for as a handy book of reference it has been in constant use by botanists and those who need to refer to plant names and uses for many years, and we can confidently predict a wider usage now it is more complete.

"The Preparation of Substances Important in Agriculture." By C. A. Peters, Ph.D. Ed. 3. 8vo. vii + 81 pp. (Chapman and Hall, London, 1919.) 4s. net.

This is best described as a series of laboratory exercises with notes upon the preparation of manures and insecticides, and is to be used by students working in the laboratory, not as a guide to the manufacturer.

"Firewoods: their Production and Fuel Values." By A. D. Webster. La. 8vo. ix + 95 pp. (Fisher Unwin, London, 1919.) 12s. 6d. net.

Renewed attention has perforce been directed to the use of wood as fuel, and where it can be procured who would not rather have a wood fire than a coal one? This book contains a great deal of valuable information concerning the relative values of various woods as fuel and a reprint of the wood-fuel order issued under D.O.R.A. A cheap edition would find a wider public.

"Commercial Forestry in Britain: Its Decline and Revival." By E. P. Stebbing. 8vo. vi + 186 pp. (John Murray, London, 1919.) 6s. net.

Amongst the many books that have of late appeared on the important question of afforestation and our timber supplies "Commercial Forestry" must hold first place. It is candid, moderate, and written by one who has evidently studied the subjects in all its phases.

For convenience of reference the book is divided into three parts the past, the War period, and the future. These are again sub-divided into various chapters, which give in a very concise manner the history of our woodlands and what we know of the old forests of our country, their past history, and the cause of their present absence.

Commencing with the Roman period, when Julius Cæsar described the face of England as "one horrible wood," the history of British forestry up to the passing of the "Statute of Enclosure" in 1482 is quickly reviewed, fuller details being given from that date to the appointment of a Parliamentary Committee on Forestry in 1885, and onwards to the outbreak of the Great War in 1914. To those who are interested in our timber supplies, it is sad to read of the wholesale devastation of our woods that took place during the Civil War, or from about the beginning of the fifteenth century on to the Restoration, when whole forests were razed to the ground or laid waste by the most ruthless destruction.

From the evidence of John Evelyn in England, from the statement of various writers of authority in Scotland, and from authentic Irish records, extensive and valuable forests extended throughout the three kingdoms up to the beginning of the sixteenth or middle of the seventeenth century. From that date onwards we have many accounts of wholesale and wanton destruction, to which the attention of successive Governments was in vain directed. Cromwell recognized the importance of preserving our woodlands and appointed woodreeves to look after the valuable forests of oak that were becoming fast denuded in Central and Western Ireland, from which in 1611 no less than 20,000 trees were marked for the King's use in two of the southern counties.

In Scotland, which was originally well wooded, we find that a dearth of timber was being felt, and in the early years of the seventeenth century, extensive planting operations were undertaken by the far-seeing Duke of Atholl and other enterprising landowners, and to-day these are the very plantations from which the finest coniferous timber for carrying on the War was obtained. On no less than seven occasions during the past thirty-two years has the question of afforestation been brought before Parliament, while private conferences would about treble that number.

The present Afforestation Scheme has been fully gone into by Mr. Stebbing, and our views quite coincide with his, that not only is the proposed area—1,700,000 acres—too small, but the period over which the planting is to be engaged is too long to be of any practical value in the near future with reference to our timber demands. Originally our own suggestion was that 5,000,000 acres should be planted, but strong opposition caused us to reduce the area to 3,000,000, and latterly to 1,000,000 acres, the whole to be planted in twenty-five years.

Regarding State-owned forests, this is a point with which we are in full accord, as only the State can provide the necessary capital or acquire land on the most favourable terms and in sufficient quantity for any large scheme of afforestation, and the resources and continuity of a nation will always make it the best custodian of forest property. Private individuals labour under many disadvantages, particularly in the length of time required before the money expended on planting can be even partially repaid. Forest education and schools of forestry come in for a share of attention, but though we are by no means averse to "a sound, scientific training in the theory of the subject," yet let this be in conjunction with the practical, for past experience and the present condition of Scottish woods clearly point out that in order to produce the best class of foresters, a thorough training on a well-timbered estate is absolutely necessary. We cannot agree with the author when he condemns notch planting with the spade as a pernicious practice, for have not many of the most successful northern woods, and from which the finest larch and Scotch fir timber for war purposes were obtained, been so formed? But altogether

Mr. Stebbing's book is by far the best contribution to the subject of commercial forestry that has appeared in this or any other land, and we hope it may be the means of hastening on the valuable but long overdue work of the Forestry Sub-Committee of Reconstruction.

"Our National Forests: A Short Popular Account of the Work of the United States Forest Service on the National Forests." By Richard H. D. Boerker. 8vo. lxix + 238 pp. (Macmillan, New York, 1919.) \$2.50.

The author truly says that the practice of forestry has become an important part in the household economy of civilized nations, and that through misuse of its forest resources destruction is quickly followed by timber famines, floods, and erosion. Probably one of the greatest achievements in the history of forest conservation is the bringing under administration and protection the vast woodlands of the United States, which roughly extend to 155,000,000 acres. Having from time to time read much that has been written regarding these forests, we can confidently say that the present book contains in readily accessible form a far larger amount of useful information regarding the past, present, and future of these woodlands than has before been contained in a single volume. The contents are divided into four headings: (1) The Creation and Organization of the National Forests; (2) The Administration of the National Forests; (3) the Protection of the National Forests; and (4) The Sale and Rental of National Forest Resources.

It may be a surprise to many that 15,000,000 acres of national forest lands, which are capable of producing timber and valuable chiefly for that purpose, have been denuded of their original tree growth. These lands are not adapted to either agriculture or grazing and in their present condition are practically unproductive barrens. The methods of reforestation, either by direct seed-sowing or by tree-planting, are very clearly set out, and, though akin to those practised in this country, contain much that is worthy of copying, whether as to the best ways of rearing young forest trees or selecting, harvesting, and sowing the various seeds of desirable coniferous and hardwooded species. In the last chapter, which deals with the sale and disposal of national forest timber, the methods of lotting, advertising, and checking are worthy of imitation, while the system of issuing grazing permits does away with unnecessary trespass as well as insuring that the fees are converted into the right channel.

Short notes on tree diseases, insect attacks, and injury from flood and fire are all welcome; indeed, within the 230 pages is contained a mine of useful information regarding the trees of which the vast forests of the United States are mainly composed.

The book is beautifully and copiously illustrated, the illustrations being of distinct value in elucidating the text.

"Botany of the Living Plant." By F. O. Bower, Sc.D., F.R.S. 8vo. x + 570 pp. (Macmillan, London, 1919.) 25s. net.

A considerable time has elapsed since the appearance of an altogether new botanical text-book for fairly advanced students so complete, so clear, and so authoritative as this. It is indeed a more scientific but no less lucid account of plant life than Kerner's "Natural History of Plants." It gives a straightforward account of the structure and functions of plants, illustrated by examples taken from various parts of the world, and, where necessary, by capital drawings, many of them especially, and skilfully, made for this work. A feature of great value is the italicized sentence or two summing up each of the important facts and principles of botany as they are dealt with. Where subjects are still matters of speculation the different opinions held are generally clearly stated, but here and there a comparatively new view of a special and restricted phenomenon is omitted. Thus the explanation of the variety of flowers and difference in habit of different parts of the curious *Cytisus Adami* is readily understood on Winkler's hypothesis of a chimera, and this affords a more satisfactory explanation of all the facts than the one given. The book is one which should be available to every student, and we hope that circumstances may soon permit a reduction in price.

"Gardening Illustrated" and "Farm and Home," established some thirty odd years ago by Mr. Wm. Robinson, have changed hands.

They are now the property of Mr. John Nayler, J.P., who has been associated in the management of both papers for the past few years.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
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 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.
 Wilson, G. F.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal Cape of Good Hope	Agr. Jour. Cape G.H.
American Journal of Botany	Amer. Jour. Bot.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Applied Biology	Ann. Appl. Biol.
Annals of Botany	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beihft zum Botanischen Centralblatt.	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticulura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Brotiana	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticulura	Boll. R. Soc. Tosc. Ort.
Botanical Gazette	Bot. G. z.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéeenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research	Jour. Agr. Res.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Ecology	Jour. Ecol.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal of the Society of Chemical Industry	Jour. Soc. Chem. Ind.

Journals, &c.	Abbreviated title.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst.	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia .	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Gard.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc. . .	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc. . .	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc. .	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins . .	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications . .	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Agave fourcroydes Lem. By A. Berger (*Bot. Mag.* t. 8746; 1918).—Native of Yucatan. The species which supplies from its leaves the fibre known as Henequen. It is grown in most tropical and semi-tropical countries, and is sometimes used as a hedge plant. Reproduction is provided for by seeds, viviparous bulbils which arise on the panicle, and also by suckers. The inflorescence is 18–21 feet high, slightly curved at the top. The flowers are yellowish-green, 2½–3 inches long.—*L. C. E.*

Alnus firma Sieb. et Zucc. var. **Yasha**. By S. A. Skan (*Bot. Mag.* t. 8770; 1918).—Native of Japan. A small tree belonging to the section of the genus characterized by having the female inflorescences in terminal racemes, which make their appearance in spring. The leaves are ovate-lanceolate, glabrous above, adpressed pubescent beneath, lateral nerves ten to sixteen on each side of the midrib, nearly parallel. Male catkins, solitary or in pairs, female catkins in terminal racemes of two to five together.—*L. C. E.*

Angraecum gracillipes Rolfe (*Bot. Mag.* t. 8758; 1918).—Native of Madagascar. A species first grown in this country under the name of *A. recurvum*, from which it differs in its greatly elongated pedicels and its much larger leaves. *A. gracillipes* thrives well under the same treatment as that required for *A. eburneum*. The flowers are white and very showy.—*L. C. E.*

Aphides, Apple. By F. V. Theobald (*Jour. Bd. Agr.* vol. xxvi, No. 1, April 1919).—A full account of the following three of the four aphides of general importance recorded as attacking the apple in Great Britain:—Blue Bug or Rosy Apple Aphis (*Aphis malifoliae*), Green Apple Aphis (*Aphis pomi*), and the Oat Apple Aphis (*Siphocoryne avenae*). The fourth, which is not treated in this article, is the Woolly Aphis or American Blight. The life histories are given, and an account of the damage done. Prof. Theobald advocates "preventive treatment" in autumn, either by spraying or dusting trees to kill exposed oviparous females and prevent egg-laying. It must be thoroughly done, as a few females left will deposit eggs from which numerous young will be produced the following spring. Spraying in spring, when buds are swelling, with a wash compound of 1 to 1½ cwt. lime, 5 lb. salt, 100 gallons water, is also advocated, as this kills newly-hatched aphides, while those hatched later are prevented from entering the opening buds. Soft-soap and water, nicotine, or pyridine are all recommended for use later.—*G. C. G.*

Aphids, Economic, Alternation of Hosts in. By W. M. Davidson (*Jour. Econ. Entom.* vol. xi, June 1918, pp. 289–294).—Of the twenty-one economic species with alternate host habits mentioned in this paper, at least fourteen are common to Europe as well as America.

Whilst the author is considering these aphids' habits in America only, the alternate hosts are of interest here.

The Hop Aphis (*Phorodon humuli*) alternates between hop and plum. Black Cherry Aphis (*Myzus cerasi*) between cherry and Lepidium. Bean Aphis (*Aphis rumicis*) feeds in summer on Leguminous and Chenopodiaceous plants. Woolly Aphis (*Eriosoma lanigerum*) apple and pear, and passes the winter in a dormant state on elms. Oat Aphis (*Aphis prunifoliae*) reproduces all the year round in semi-tropical zone and winters in the north on apple. Peach Aphis (*Myzus persicae*) has a long list of hosts, mostly cultivated plants.

Many species are of economic importance at one period of the year only. The alternating host being a weed, it provides another excellent reason why certain weeds at least should be destroyed. Examples of such aphides are: *Rhopalosiphon lactucae*, which migrates between currant, gooseberry, and sow-thistle (*Sonchus*). *Aphis malifoliae*, apples, rib-grass, and plantains. *Hyalopteris arundinis*, the mealy plum aphid which passes the summer on reeds. The paper concludes with a useful bibliography covering two pages.—*G. W. G.*

Aphids Injurious to Orchard and Bush Fruits. By A. L. Quaintance and A. C. Baker (*U.S.A. Dep. Agr. Bur. Entom., Farm. Bull.* 804, April 1917; 30 figs.).—Contact sprays such as kerosene emulsion, soap washes, nicotine solutions, etc., must be used to kill aphids. Directions for applying and preparing them are given in this bulletin.—V. G. J.

Aphis, Red Currant, *Myzus ribis*. By M. D. Haviland (*Proc. Roy. Soc. Edin.* 39, pp. 78–112; with 9 figs.).—This paper deals with the life history and bionomics of this well-known Aphis, whose life cycle had never been determined. The stem-mother Aphis hatches in April, passes a three weeks' larval period, producing red blisters on the leaves. (These are not caused by the young Aphides, produced in early May, as was thought by many.)

It is migratory to Labiatae and other weeds during the summer, but the migration is not essential, as the whole life cycle may be passed on Currant. After migration it has been described as a different species, *Phorodon galeopsidis*. *M. whitei*, recorded from England, and *M. dispar*, recorded from America, may both be proved to be identical with *M. ribis*.

Winged forms were less productive and shorter-lived than wingless.

It has both predaceous and parasitic enemies, particularly a small parasitic Braconid, *Aphidius ribis*.

The bushes should be sprayed with nicotine solution or paraffin emulsion in April as soon as the buds open, and again in early May. Where small numbers are present, pick off blistered leaves.—G. F. W.

***Asparagus falcatus* Linn.** By C. H. Wright (*Bot. Mag.* t. 8751; 1918).—Native of Ceylon; Tropical and Extratropical South Africa. A species which has long been in cultivation as a greenhouse climber, and is sometimes confused with *A. Sprengeri*. The flowers are borne in racemes and are white in colour and sweet scented. This species thrives best in a poor gravelly soil and can be propagated, either by seeds or cuttings taken from the smaller branches.

L. C. E.

Beans susceptible to Mosaic, Additional Varieties of. By D. Reddick and V. B. Stewart (*Phytopathology*, ix, pp. 149–152, March 1919).—The authors give a long list of varieties of bean which they found to be susceptible to mosaic disease in addition to those already reported. 'Robust' has proved immune, and this is so far the only one proved to be so.—F. J. C.

Beans, Varietal Susceptibility to Strains of *Colletotrichum Lindemuthianum*. By M. F. Barrus (*Phytopathology*, viii, pp. 598–614, Dec. 1918; plates).—More than one strain of the fungus, *Colletotrichum Lindemuthianum*, exists, and while some varieties of bean (*Phaseolus vulgaris*) are resistant to one, they are liable to attack by another strain. The source of immunity is thus probably different from that of immunity of other species of plant either nearly or distantly related to the bean. Black-eyed varieties appear to be markedly susceptible. Lists of inoculations and their results are given.—

F. J. C.

Bee Poisoning, Blossom Spraying and. By Jas. Troop (*Jour. Econ. Entom.* vol. xi, October 1918, p. 433).—A brief account of experiments in hand to ascertain the effect of arsenicals as a blossom spray is given. The programme is designed to cover both field and laboratory requirements, and it is proposed to publish in detail the results obtained after another year's work. So far as the laboratory work goes it has been found that less than 0.000005 gramme of arsenic (As_2O_3) proves fatal to a bee. This result appears to indicate that bees may be killed by an arsenical poison spray at blossom time.—G. W. G.

***Berberis Beaniana* Schneider.** By W. J. Bean (*Bot. Mag.* t. 8781; 1918).—Native of Szechuan. A hardy Barberry, 8 to 10 feet high. The leaves are deciduous, dark green above, rather glaucous beneath. The flowers are rich yellow, $\frac{1}{4}$ inch across, produced in June in corymbose panicles from the axils of the leaves. The fruits are bright purple, $\frac{3}{8}$ in. long.—L. C. E.

***Bulbophyllum Hamelinii* Rolfe** (*Bot. Mag.* t. 8785; 1918).—Native of Madagascar. A plant which thrives well in the tropical house. It can easily be distinguished from other members of the genus by the pseudo-bulbs which are concave on one side and convex on the other. The flowers, medium-sized, suffused and blotched with purple and with a dark purple lip, are borne in a drooping raceme, 4 to 5 inches long.—L. C. E.

Bulbophyllum sociale Rolfe (*Bot. Mag.* t. 8761, 1918).—Native of Sumatra. A plant for the tropical house, growing well under the cultural treatment suitable for *B. virescens*. The flowers are showy, deep orange, slightly veined with red; the lip is rose-coloured and long-clawed.—*L. C. E.*

Calcium Arsenite and Arsenate as Insecticides. By E. B. Holland and J. P. Buckley (*Jour. Econ. Entom.* vol. xi. August 1918, pp. 354–357).—It is suggested in the circumstances occasioned by the war it may be necessary to find other sources of arsenicals in addition to those usually employed. Calcium arsenite and C. arsenate have been used in the past and careful tests were made to ascertain how far they could be safely used. The arsenite salt is fairly insoluble in the presence of excess lime and contains 77.92 per cent. arsenic trioxide; spraying tests showed some injury even when mixed with strong (3 per cent.) lime water. Much the same remarks apply to the arsenate which is practically insoluble in lime water. For a safe application an admixture of lime water or Bordeaux mixture is indicated.—*G. W. G.*

Calosoma Beetle (*Calosoma sycophanta*). By A. F. Burgess (*U.S.A. Dep. Agr. Bur. Entom.*, Bull. 251, July 1915; 7 plates, 1 map, 3 tables, 3 figs.).—This insect is known to occur in France, Germany, Switzerland, Italy, and other European countries, being particularly abundant in cases where there are unusual outbreaks of destructive caterpillars. Its good work is mentioned in a number of European writings, and it is known to prey extensively on the Gypsy moth and the Pine sawfly.

It has been introduced into New England, and has now become well established. It is reproducing satisfactorily, and has already demonstrated that it is a very important factor in the control of the Gypsy moth by natural enemies.—*V. G. J.*

Celery Storage Experiments. By H. C. Thompson (*U.S.A. Dep. Agr. Bull.* 579, Sept. 1917; 10 figs.).—Celery is one of the most important truck crops grown in the United States. Six States—New York, Michigan, Massachusetts, Ohio, Pennsylvania, and New Jersey—produce about two-thirds of the celery crop, and a considerable portion of this is stored for from one to three months. The old method of storing celery in the field and in houses of the cellar type is not satisfactory, because temperature and moisture conditions cannot be controlled. The storage of celery in cold-storage warehouses is a comparatively new undertaking, and at present very little is known of the method, though it promises to be very satisfactory if the celery is packed into small crates.—*V. G. J.*

Cereus Tunilla Weber. By R. A. Rolfe (*Bot. Mag.* t. 8779; 1918).—Cactaceae. Native of Costa Rica. A small spiny shrub, shoots, slender, green and four-angled. The flowers are solitary, lateral, about 2½ inches long and rose-lilac in colour. The fruit is yellow, spiny, and said to be edible.—*L. C. E.*

Chlorpicrin, Fumigation with. By Wm. Moore (*Jour. Econ. Entom.* vol. xi. August 1918, pp. 357–362).—The discovery of the extremely high toxicity of chlorpicrin to insects has opened up the possibility of its use in fumigating grain and clothing. A careful series of experiments showed that it is much more powerful than carbon-bisulphide and has greater penetrating powers. Providing the seed is dry and thoroughly aired after fumigation, germination is not affected. It will injure neither dress materials nor their colour when free from impurities of chlorine and nitrogen peroxide. At present it cannot be obtained on the market, but inquiries from chemical manufacturers indicate that it can be manufactured and sold at a cheaper rate than CS₂. It also has the advantage of not forming an explosive mixture with air unless unduly heated.—*G. W. G.*

Cockroach Control, Experiments on. By E. V. Walter (*Jour. Econ. Entom.* vol. xi. October 1918, pp. 424–429).—These experiments show that finely powdered boric acid scattered in the haunts of cockroaches forms an easy and safe means of getting rid of this pest. The more usual mixture of borax and sugar proved to be much less effective. Borax and boric acid are said to be able to kill as a contact insecticide as well as a stomach poison. The method in which the boric acid acts is explained in the following way: Roaches have the habit of extreme personal cleanliness, and if covered with dust or powder will, if unmolested, clean themselves. It is in this way and not as food that the finely powdered boric acid is eaten. If sugar is added the mixture is heavier and is likely to cake, hence the lower efficiency obtained by the mixture as compared with the boric acid alone. Borax will not kill the eggs, hence the powder should remain for some time or the treatment be repeated after a few weeks.—*G. W. G.*

Cranberry Insect Problems and Suggestions for Solving Them. By H. B. Scammell (*U.S.A. Dep. Agr. Bur. Entom., Farm. Bull.* 860, Dec. 1917; 38 figs.).—An abundant water supply, permitting flooding and reflooding at the proper times, is the best remedy for insect injury in cranberry bogs, and when sites for new bogs are chosen this should be borne in mind.—*V. G. J.*

Cyanide Fumigation. By H. J. Quayle (*Jour. Econ. Entom.* vol. xi. June 1918, pp. 294-299).—A most interesting paper to those concerned with fumigation of trees under sheets in the field. Emphasizes the difficulty of properly fumigating the lower portion of large trees, without injuring the top: owing to HCN which, when superheated by the reaction, rises at once to the top of the tent or sheet. Formula 2, under tent data on page 298, is wrongly quoted: it should read $\frac{C^2}{4\pi} \left(\frac{O}{2} - C \cdot 144 \right)$. The error is obviously a printer's error, as the equation stated would not give tent volume.—*G. W. G.*

Diascia Alliciae Hiern. By S. A. Skan (*Bot. Mag.* t. 8782; 1918).—Scrophulariaceae. Native of South Africa. A herbaceous perennial up to 2½ feet high, not hardy in this country. Leaves opposite, ovate, dentate-serrate. Flowers borne in terminal racemes 2 to 10 inches long, pale rose, with darker blotches at the base of each lip, greenish inside the pouch.—*L. C. E.*

Double Flowers and Sex Linkage in Begonia. By W. Bateson and I. Sutton (*Jour. Gen.* 8, pp. 199-207; pl.; June 1919).—The results of an investigation into the meaning of doubling in Begonias are given. Both garden forms and the wild species *Begonia Davisii* were used, and the conclusion to which the results point—viz. that all the pollen grains carry the factor for doubling, as do the pollen grains of certain strains of stocks—is remarkable in a wild species.
F. J. C.

Drying Plant, A Successful Community. By C. W. Pugsley (*U.S.A. Dep. Agr., Farm. Bull.* 916, Dec. 1917; 9 figs.).—A successful community drying plant for fruit and vegetables is described in this bulletin. Municipalities might well establish plants from public funds, a small charge being made for use of plant at the rate of so much per tray, which would defray the initial expense and pay for the upkeep and working expenses.—*V. G. J.*

Echeveria setosa Rose. By M. L. Green (*Bot. Mag.* t. 8748; 1918).—Crasulaceae. Native of Mexico. A greenhouse succulent. The leaves are very numerous, probably a hundred or more, crowded together in a dense rosette. The inflorescence is scorpioid, either simple or forked. The flowers are red towards the base and yellow above.—*L. C. E.*

Erlangea aggregata. By J. Hutchinson (*Bot. Mag.* t. 8755; 1918).—Compositae. Native of Angola. A perennial plant for the greenhouse, attaining a height of 5 to 6 feet. The flower heads are densely clustered, blue flushed with rose. In this country it flowers in midwinter. It can be easily propagated by cuttings from which full-sized plants can be grown in a single season.—*L. C. E.*

Fumigation Experiments: The Time Factor. By A. F. Swain (*Jour. Econ. Entom.* vol. xi. June 1918, pp. 320-324).—The experiments here enumerated go to prove that with ordinary 8 oz. U.S. Army duck, or similar type of fumigation sheets, an exposure of 45 minutes to the action of HCN gas is as efficient in insect control as any other length of exposure. The reason for this is mainly the diffusion of the gas through the material forming the tent or sheet; and the remarks do not apply to fumigation under an impervious material. The writer's experience of fumigation under similar conditions confirms the conclusions reached by the author.—*G. W. G.*

Ginkgo, Monœcious. Corporal J. Platts (*Gard. Chron.* April 12, 1919) states, in an account of the Botanic Garden at Bonn, that he saw an interesting specimen of *Ginkgo biloba* about 20 feet high, and divided about 6 feet from the ground by a crotch; one half of the tree is male, the other half female, the latter being weighted down with fruit. The monœcious character was entirely natural and not the result of either budding or grafting, and he failed to see any indications of either.

It may be added that Elwes and Henry in "Trees of Great Britain" mention a similar tree at Vienna, but in this case the female was grafted on the male tree (vol. i. p. 57).—*Gerald Loder.*

Globe Artichoke, Culture of the. By J. W. Wellington (*U.S.A. Agr. Exp. Sta., New York, Bull.* 435, May 1917; 2 plates, 3 figs.).—The plant is not fully hardy in the colder localities and requires covering to endure the winter. Coal ashes are the most satisfactory material for this purpose. Before mounding with ashes the leaves must be cut back to within a foot of the ground and drawn in about the crown.

Practically only one insect attacks the globe artichoke; this is a black aphid which can be readily controlled by spraying with a solution of Black-leaf 40 and whale-oil soap.—*V. G. J.*

Gongora latisejala Rolfe (*Bot. Mag.* t. 8766; 1918).—Orchidaceae. Native of Colombia. An epiphytic plant for the tropical house. The leaves are elliptic, somewhat recurved and about 10 inches long. The inflorescence is a many-flowered raceme, flowers showy, abundantly dotted with brown spots.—*L. C. E.*

Govenia tingens Poepp et Endl. By R. A. Rolfe (*Bot. Mag.* t. 8768; 1918).—Orchidaceae. Native of Peru. A terrestrial orchid for the tropical house. The leaves are 8 to 12 inches long, recurved, elliptic oblong. The flowers are borne in a many-flowered raceme 4 to 6 inches long. The flowers themselves are medium-sized, whitish, the petals finely rose punctate, the lip greenish yellow.—*L. C. E.*

Horse-Radish Flea-Beetle, The: Its Life-history and Distribution. By F. H. Chittenden (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 535, June 1917; 6 figs.).—The growing of horse-radish in the North is menaced by the introduction from Europe of a small insect known as the horse-radish flea-beetle (*Phyllotreta armoraciae* Koch). The species passes the winter in hibernation as a beetle and comes out in its northern range in April and May.

No systematic control has yet been adopted.—*V. G. J.*

Howea Belmoreana Becc. By C. H. Wright (*Bot. Mag.* t. 8760; 1918).—Palmae. Native of Lord Howe Island. A close ally of *H. Fosteriana* and often confused with it. Both these palms require an intermediate temperature and are very useful as decorative plants owing to the fact that they bear rough usage better than most palms. The leaves are clustered at the top of the stem, 7 to 8 feet long. The flower spikes are produced in the axils of the lowermost leaves, the spadix is drooping, monœcious and about 3 feet long. The flowers are numerous, arranged in groups of three, the two lateral ones male, and the central female.—*L. C. E.*

Hymenoptera Parasitica, Notes on the Bionomics, Embryology, and Anatomy of Certain; especially Microgaster connexus. By J. Bronté Gatenby (*Journ. Linn. Soc.* 33, pp. 387-416; 3 figs.; 1919).—An account of certain Hymenopterous Parasites and Hyperparasites attacking the larvæ of Cabbage White Butterfly (*Pieris brassicae*), Gold Tail Moth (*Porthesia similis*), and Aphidæ.

The structure of alimentary tract, brain, gut, heart, spinning glands, and tracheal system of *Microgaster connexus* are minutely described, with several new facts regarding the anatomy of its larva, and particularly its abdominal vesicle, whose function appears to be respiratory.

A hyperparasite was found in *Microgaster* larvæ, of which about 10 per cent. were hyperparasitized.

The parasites of Aphidæ are briefly dealt with, and it is stated that no Ichneumonids parasitize Aphids.—*G. F. W.*

Hypericum laeve Boiss. var. *rubra*. By O. Stapf (*Bot. Mag.* t. 8773; 1918).—Native of the Orient. A graceful 'St. John's Wort' which, however, is not quite hardy in this country. The leaves are linear $\frac{1}{2}$ to $\frac{3}{4}$ inch long, dotted with transparent glands. The flowers are small, golden yellow with a scarlet-reddish tinge. In the absence of seeds it can be propagated by cuttings made from the young shoots and attains a height of 1 to 2 feet.—*L. C. E.*

Indigofera pendula Franch. By J. Hutchinson (*Bot. Mag.* t. 8745; 1918).—Native of Yunnan. A graceful shrub of about seven feet in height, dying back to the ground level in winter. The flowers are borne in pendulous racemes from 15-18 inches long and are rose-purple in colour. It is a plant which likes a sunny position and an open well-drained soil; it is as hardy as most of the cultivated *Indigoferas* and like them can be easily propagated by cuttings.

L. C. E.

Infection by certain Fungi, the Relation of Temperature and Humidity to. By J. I. Lauritzen (*Phytopathology*, ix. pp. 7-35, Jan. 1919).—The author found degree of infection to depend largely upon the temperature and to increase rapidly up to a certain point in several plants. The humidity permitting infection varied generally between 92 and 100 per cent., but it was found unnecessary that a film of water should be present over the leaf surface. A bibliography is given.—F. J. C.

Influence of Trees and Crops on Injury by White Grubs, The. By Stephen A. Forbes (*U.S.A. Exp. Sta. Ill., Bull.* 187, Feb. 1916).—Experiments show that more eggs were laid in pastures than in any other crop; small grain came next; fallow land, grown up of weeds, largely grasses, third; clover and corn fourth; and meadow crops—excluding clover—were least sought by the egg-laying beetles.—V. G. J.

Insect Eggs, Toxicity of Organic Compounds to. By W. Moore and S. Graham (*Jour. Agr. Res.* xii. pp. 579-587, March 1918).—Compounds with high boiling-point and slight volatility are more effective for dipping and spraying insects' eggs than are those of low boiling-point and high volatility. Compounds with low boiling-points kill freshly-laid eggs most readily, but those with high are more toxic to eggs containing forward embryos. Paraffin, both of high and low boiling point, is destructive to old and young eggs. The toxicity of vapour of organic compounds to insect eggs increases with the increase of boiling-point and decrease of volatility.—F. J. C.

Insecticide, A Promising New Contact. By Wm. Moore (*Jour. Econ. Entom.* vol. xi. June 1918, pp. 341-342).—Nicotine oleate may be made directly from any nicotine preparation containing free nicotine. Two and a half parts of a 40 per cent. nicotine solution unites with one and three quarters parts of commercial oleic acid or red oil. Four and one-fourth parts of this soap will then contain one part of nicotine. Nicotine oleate, it is said, will cost the farmer about one dollar per 100 gallons.

Nicotine oleate diluted to give one part nicotine in 1,500 parts of water is efficient against aphides. The oleate may be used to make an oil emulsion spray. Ten parts of kerosine mixed with one and one-quarter part of commercial oleic acid, adding two and one half parts of 40 per cent. nicotine sulphate well shaken up, forms an emulsion; which is again stirred with ten parts of water. Diluted with 480 parts of water is useful against mealy bugs, white fly, and soft scale. Emulsified with a heavy oil nicotine oleate should be valuable for the destruction of scale insects and eggs on dormant trees. It is important to note that soft water (rain or distilled) is essential with N. oleate.—G. W. G.

Insecticides, Physical Properties governing the Efficacy of Contact. By W. Moore and S. A. Graham (*Jour. Agr. Res.* xiii. June 10, 1918; pp. 523-538; 1 fig.).—These authors continue their observations on Spray Fluids, particularly explaining the difference between "wetting" and "spreading" of contact washes. There must be wetting before there can be spreading, but it does not follow that where there is wetting there must be spreading.

Contact washes may be divided into two classes—(1) those which wet the insect and are able to spread over its body surface and pass up the tracheæ by capillarity; and (2) those which wet the insect and are able neither to spread over the surface nor to gain entrance into the tracheæ.

Oil emulsions may enter the tracheæ as such, or the oil remains after the emulsion is broken down, and may spread over the insect and enter the spiracles.

Tables show penetration of various chemicals, stained with Trypan blue, into insect's tracheæ.—G. F. W.

Insecticides, The Mode of Action of Contact, Observations on. By William Moore (*Jour. Econ. Entom.* vol. xi. December 1918, pp. 443-446).—This paper is a continuation of a paper on the physical properties governing the efficacy of contact insecticides, and gives an account of some highly interesting experiments proving that fat solvents, oils, and soaps are able to penetrate the tracheæ of insects by capillarity and may result in the death of the insect by their purely mechanical action alone. It is necessary for this result to cover all or nearly all of the spiracles. The inferences drawn are that for insects such as plant lice, an insecticide killing in a mechanical way will give good results, but for larger insects it is necessary to add to the wash an insecticide capable of killing in a chemical manner to insure death, as it becomes unlikely that all the tracheæ would be blocked. It is interesting to note in passing that the efficacy of free nicotine sprays has been increased 50 per cent. by the addition of soap. It was

found that some insects, *e.g.* the clothes louse (*Pediculus corporis*), are able to close the tracheæ so quickly as to keep out soap solution, oils, and xylene. This point may have considerable bearing on the composition of the various types of dips which are likely to be successful.—G. W. G.

Lettuce and Celery, The Handling and Precooling of Florida. By H. J. Ramsey and E. L. Markell (*U.S.A. Dep. Agr. Bull.* 601, Dec. 1917; 16 figs. and tables).—Decay in lettuce in transit was found to be largely due to lettuce drop, a disease which enters the head mainly through the lower leaves. Experimental heads of lettuce were cut just above the two or three lower leaves, and all damaged leaves were removed. Consequently there was far less decay in transit than with the usual method of cutting.

Lettuce in cars that were pre-cooled at the shipping point to a temperature of about 40° F. developed considerably less decay in transit than that in ordinary cars. The combination of careful cutting and precooling enabled the lettuce to reach its destination in perfect condition.

Celery is often injured in transit because it is loaded too high in the cars to permit proper air circulation. Small crates insure more rapid cooling. Pre-cooled celery was stored successfully for four weeks, but stored non-precooled celery developed considerable decay during the same period.—V. G. J.

Linum elegans Sprunner. By M. L. Green (*Bot. Mag.* t. 8769; 1918).—Native of Greece. A tufted plant of about 8 inches in height which has not yet been proved hardy in this country. The inflorescence is cymose, two to seven flowered; the petals are yellow, spreading, nearly an inch long. It grows well in a frame, but does not ripen seeds. It can, however, be easily propagated by means of cuttings.—L. C. E.

Macodes Sanderiana Rolfe (*Bot. Mag.* t. 8744; 1918).—Native of the Malay Archipelago. A terrestrial orchid, grown for its attractive foliage, it thrives best in a mixture of sphagnum and peat fibre, under a bell-glass cover. The leaves are ovate-elliptic, 2½–4 ins. long, 1½–2 ins. wide, with handsome yellow reticulate venation on a deep olive-green or greenish-brown ground. These plants very rarely flower and usually die after doing so; the flowers are born in a scape about a foot high and are pale green in colour.—L. C. E.

Malus Sargentii Rehd. By W. J. Bean (*Bot. Mag.* t. 8757; 1918).—Native of Japan. A species closely allied to *M. Toringo* Sieb., but differing from that species in its larger flowers, overlapping petals, and larger fruit. It is perfectly hardy and very attractive both in flower and when in fruit. The flowers are white, about 1 inch wide, opening in May. The fruits are red, depressed globose, ½ to ¾ inch wide.—L. C. E.

Manure, Storage of, and Fly Suppression at Durban Remount Depot. By Chas. K. Brain (*Jour. Econ. Entom.* vol. xi. June 1918, pp. 339–341).—Although the depot contained close on 100,000 animals and was situated in Durban surrounded by inhabitants, the excellent measures adopted for storage of manure and fly suppression prevented any nuisance to the community. The stalls and paddocks were swept with a hard broom daily and the manure and litter carted to huge trenches. The manure was spread to the depth of about a foot and covered with ¾ inch of sand, ashes, or earth. It was arranged that the carting of fresh material would be over this surface so that the whole would be added to foot by foot and well pressed down. No disinfectants or lime was added. This method of storing produces a dense peaty mass of manure which analysis shows to be of a very good quality.

It was found necessary after sweeping the stalls to use a contact spray consisting of:

Caustic soda	2 pounds	
Boiling water	50 gallons	
Paraffin	5 "	} added while hot.
Hycol	5 "	

Blue-gum branches and pieces of sacking dipped in fly bait were hung about wherever flies tended to congregate. The composition of the fly bait used was:

Arsenite of soda	5 pounds
Black sugar	5–20 "
Water	25 gallons

The usual quantity of arsenite would be about 2½ lb., and as this quantity kills efficiently there seems no useful purpose in increasing it.—G. W. G.

Mealybug, The Common, and its Control in California. By R. S. Woglum and J. D. Neuls (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 862, Sept. 1917; 4 figs.).—This bulletin discusses the three remedies which have been widely used—i.e. fumigation, spraying, and the artificial spread of insect enemies.

V. G. J.

Melicetyus ramiflorus Forst. By S. A. Skan (*Bot. Mag.* t. 8763; 1918).—Violaceae. Native of New Zealand and Polynesia. A shrub of considerable size for the temperate house. The leaves are 2 to 6 inches long, oblong-lanceolate with a serrate margin, polished dark green above, paler beneath. The flowers are inconspicuous, born in axillary clusters and pale yellowish-green in colour. The fruit is a violet-blue, depressed globose berry $\frac{1}{8}$ to $\frac{1}{4}$ inch across.—L. C. E.

Mesembryanthemum edule Linn. By R. A. Rolfe (*Bot. Mag.* t. 8783; 1918).—Native of South Africa. A handsome succulent which requires the protection of a greenhouse in winter. It grows best when planted along the top of a low wall and allowed to hang down; a poor sandy soil suits it best and it can be propagated by cuttings taken at any time of the year. The flowers are about 3 inches across, yellow when first open, changing later to flesh colour.

L. C. E.

Mesembryanthemum Elishae N. E. Br. By R. A. Rolfe (*Bot. Mag.* t. 8776 b; 1918).—Native of South Africa. A member of the section 'Cordiformia,' in which the leaves are very fleshy and somewhat elongated, more or less united at the base but free above. The leaves are glaucous green, with scattered darker dots. The flowers are bright yellow, $\frac{3}{4}$ inch across.—L. C. E.

Mesembryanthemum fulviceps N. E. Br. By R. A. Rolfe (*Bot. Mag.* 8776a, 1918).—Native of South Africa. A member of the 'Sphaeroidea' section of the genus, in which the leaves are reduced to a single pair, united to form a globose mass termed a 'corpusculum.' Flowers about an inch across, yellow tipped with orange.—L. C. E.

Monadenium erubescens N. E. Brown. By O. Stapf (*Bot. Mag.* t. 8756; 1918).—Euphorbiaceae. Native of East Africa. A plant which grows well in a warm succulent house, under the treatment suitable for species of Stapelia. It has a perennial globose tuber 8 to 14 inches in diameter. One to two stems are produced from each tuber bearing rather fleshy leaves, green above, reddish with green veins beneath. The inflorescence is reduced to a solitary drooping cyathium surrounded by involucre bracts. The bracts are united to the middle to form a bell-shaped cup, white, finely veined with green, tinged with rose towards the base. Cyathium pale green cleft on one side to the middle, surrounded by a thick yellow annular gland. The male flowers are naked mixed with fimbriate bracteoles, female flower drooping exserted from the cleft of the cyathium.—L. C. E.

Mosquito Larvæ, The Effects of Petroleum Oils on. By S. B. Freeborn and R. F. Attstätt (*Jour. Econ. Entom.* vol. xi. June 1918, pp. 299–308).—The authors enumerate six theories, including their own, which have been advanced in explanation of the lethal effect of petroleum oils on mosquito larvæ. The experiments are arranged and tend to prove the contention that it is the oil vapour from the inspired oil through its extremely rapid penetration of the tracheal tissues that is mainly responsible for the lethal action. The work was originally undertaken to check the recommendation of the entomological division of the University of California, of a mixture of crude oil and kerosine in equal proportions as the best for oiling (Baumé 28° to 32°).

The conclusions reached are: The toxicity of the petroleum oils as mosquito larvicides increases with an increase in volatility. The volatile constituents are responsible for the primary lethal effects, by penetration of the tracheal tissue. In the heaviest oils (boiling point greater than 250° C.) this action may be secondary to the purely mechanical suffocation by the plugging of the tracheæ. The paper concludes with a bibliography.—G. W. G.

Mushroom Pests and how to control them. By C. H. Popenoe (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull.* 789, Feb. 1917; 7 figs.).—The insect pests that usually attack cultivated mushrooms are mushroom maggots (the larvæ of small, gnat-like flies), mites, spring-tails, and sow-bugs or woodlice. All windows and ventilators of mushroom houses should be covered with fine wire gauze, which prevents the entrance of the fungus gnats.

Mushroom spawn should only be purchased from reliable dealers.—V. G. J.

Mustard, Wild, Control of. By O. W. Newman (*U.S.A. Dep. Agr., California State Commission of Horticulture*, vol. vi., No. 6, June 1917; 27 figs.).—The author states that many noxious weeds, especially the wild mustards, including *Brassica campestris*, *B. arvensis*, and *B. nigra*, can be largely controlled by the use of chemical sprays.

The spray most commonly used is a solution of iron sulphate, and it has in every instance proved satisfactory. The usual strength is two to one—i.e. 100 lb. of iron sulphate to 50 gallons of water. This should be applied to the growing weeds when they are about 6 inches high; the spray should be medium fine and penetrating; 50 gallons should cover one acre.—V. G. J.

Odontochilus lanceolatus Benth. By R. A. Rolfe (*Bot. Mag. t. 8753; 1918*).—Native of Sikkim and Khasia. An interesting terrestrial orchid originally described by Lindley as *Anoectochilus lanceolatus*. The plant is from 8 to 12 inches in height, and the leaves are green with three bright stripes. The flowers are light green with a brown patch at the top of the dorsal petal; the lip is bright yellow, and the anther pink. It is a plant which thrives well in a damp and shady intermediate house.—L. C. E.

Odontoglossum praevisum Rolfe (*Bot. Mag. t. 8780; 1918*).—Native of Colombia. A hybrid between *O. gloriosum* and *O. Lindleyanum*. The flowers are borne in a many-flowered panicle 12 to 16 inches long, medium-sized, yellow with brown blotches.—L. C. E.

Orchard Bark Beetles and Pinhole Borers, and how to control them. By Fred. E. Brookes (*U.S.A. Dep. Agr., Bur. Entom., Farm. Bull. 763*, Nov. 1916; 18 figs.).—This bulletin gives a brief account of the principal bark beetles and related species that attack apple, peach, plum, and other orchard trees, and describes the methods most effective in controlling them.—V. G. J.

Paeonia peregrina Mill. By O. Stapf (*Bot. Mag. t. 8742; 1918*).—Native of South-eastern Europe and North-western Asia Minor. A natural species of Pæony which has been cultivated in certain parts of Europe as far back as the sixteenth century. It is a good plant for the herbaceous border and is sometimes grown under the name of 'Sunbeam.' The flowers are 2½–4 in. across, a brilliant deep red in colour.—L. C. E.

Petunia integrifolia Hort. By S. A. Skan (*Bot. Mag. t. 8749; 1918*).—Native of South America. A good species for summer bedding or conservatory decoration, better known in gardens as *P. violacea*. The flowers are at first bright rose-purple, afterwards becoming paler, outside pale rose-purple with the tube outside suffused with purple and marked with deeper purple lines.

L. C. E.

Poisonous Urticating Spines of Hemileuca oliviae Larvae, Notes on the. By D. J. Caffrey (*Jour. Econ. Entom.* vol. xi, August 1918, pp. 363–367).—It has been found that as in the case of the Brown-tail moth serious inconvenience is caused by the spines with which this species is covered. Susceptible persons may have an extremely unpleasant time by even walking through infested grass and brushing against the larval spines. In extreme cases a hand or foot may be put out of action for a time; and it has been observed that cattle avoid grazing upon infested grass. Further, something approaching asthma has been produced amongst many working on the investigations by the small spines in the atmosphere entering the bronchial tubes, and it is even suggested that it may be necessary to transfer these individuals to another part of the country to effect a cure. The urticating spines are found on several species of *Hemileuca* in addition to *H. oliviae*.—G. W. G.

Polystachya Pobeginii Rolfe (*Bot. Mag. t. 8772; 1918*).—Orchidaceae. Native of Tropical Africa. A plant for the tropical orchid house, thriving well in a mixture of peat fibre and sphagnum. The flowers are borne in a many-flowered raceme, the flowers themselves are medium-sized, bright rose, with a yellow crest on the lip.—L. C. E.

Potato Culture in Maine. By E. L. Newdick (*U.S.A. Dep. Agr.*, vol. xvii, March 1918, No. 1; 1 fig.).—This bulletin gives a very detailed account of potato culture as practised in Maine, and contains combined formulæ for "bugs" and blights.—V. G. J.

Potato-spraying Experiments. By E. S. Salmon and H. Wormwald (*Jour. Bd. Agr.* vol. xxvi. No. 1, April 1919).—An account of potato-spraying experiments conducted at the East Malling Fruit Experiment Station. Bordeaux and Burgundy mixtures were used, of two strengths, viz. (i) containing 1 p.c. copper sulphate, and (ii) 1.4 p.c. copper sulphate. 'British Queen' was the variety sprayed.

The authors summarize the results as follows:—(i) Under certain seasonal conditions one application of Bordeaux or Burgundy mixture to a second early variety of potatoes may result in loss owing to the spraying lengthening the period of ripening while not protecting the crop from attacks of blight. (ii) Under the same seasonal conditions as referred to above, two sprayings with either Bordeaux or Burgundy mixture resulted in an increase of 2½ tons and 1½ ton, respectively, of sound tubers to the acre.—G. C. G.

Potato Storage and Storage Houses. By William Stuart (*U.S.A. Dep. Agr., Farm. Bull.* 847, July 1917; 20 figs.).—Good storage is a vital factor in maintaining the vigour of seed stock. Its value is not yet properly recognized by the grower. Thorough aeration of the stored tubers and exclusion of light are essential for the best preservation of stock.

Careful investigations during several seasons have clearly demonstrated that losses in storage can be largely prevented by the proper construction and management of storage houses.

With high prices and scarcity of supply, the need of conserving the entire production for seed and food purposes is essential.—V. G. J.

Primula anisodora Balf. f. et Forr. By J. Hutchinson (*Bot. Mag.* t. 8752; 1918).—Native of Yunnan. A striking *Primula* of the Candelabra section, discovered by Mr. G. Forrest. It has proved hardy in a sheltered nook and attains a height of about 3 feet. The flowers, which are borne in a terminal umbel, are of a deep purple, almost black colour, with a yellow eye, and all parts of the plant when fresh are strongly aromatic, the odour resembling that of aniseed. The leaves are oblong-oblancoate from 6 to 8 inches long. Like many other species, *P. anisodora* dies after flowering freely, but produces an abundant supply of good seeds.—L. C. E.

Primula sinopurpurea Balf. f. By J. Hutchinson (*Bot. Mag.* t. 8777; 1918).—Native of Yunnan. A hardy *Primula* for the rock garden, growing well in half shade, and must be treated as a biennial. It is closely allied to *P. nivalis*, but differs in its more remotely repand-denticulate leaves, conspicuously farinose on the under side. The flowers are deep violet about 1½ inches across.—L. C. E.

Primula sylvicola Hort. By J. Hutchinson (*Bot. Mag.* t. 8762, 1918).—Native of Yunnan. A handsome *Primula* closely allied to *P. sino-mollis* Balf. f. et Forr., from which it differs in its much shorter corolla-tube which scarcely protrudes beyond the tips of the calyx lobes. *P. sylvicola* is too tender to be grown out of doors and does best when treated as a biennial. The flower spikes reach a height of about 2 feet and the plants remain in flower for about three months in spring. The flowers are rose-purple in colour.—L. C. E.

Pteridophyllum racemosum Sieb. By O. Stapf (*Bot. Mag.* t. 8743; 1918).—Papaveraceae. Native of Japan. A hardy perennial plant; although mainly of botanical interest, its foliage renders it quite worthy of a place in the Rock Garden. The leaves form a rosette, they are 2½–6 ins. long, unevenly pectinately pinnatisect. Plants grown in a frame keep their leaves throughout the winter, but those grown outside lose their leaves. Inflorescence racemose, flowers small, white.—L. C. E.

Radish Maggot, The. By P. J. Parrott and H. Glasgow (*U.S.A. Dep. Agr., New York Agr. Exp. Stn., Bull.* 442, Nov. 1917; 8 plates, 2 figs.).—The radish or cabbage maggot (*Phorbia brassicae* Bouché) dwarfs and destroys early cabbage; attacks seedlings of late cabbage, and causes maggoty radishes. It is a common pest, and varies in importance from year to year. During some seasons it is very destructive.

Practical measures for production of radishes that are largely exempt from insect attack are early sowing and growing of plants in frames screened with cheesecloth.—V. G. J.

Ramondia serbica Pančić. By S. A. Skan (*Bot. Mag.* t. 8765; 1918).—Native of Serbia. A pretty plant for the rock garden, bearing a close general resemblance to *R. pyrenaica*, but its flowers are not quite so large, neither is

it so robust in growth. The flowers of *R. serbica* are lilac with a yellow bearded throat; it is easily propagated by seeds and grows well in the same situations as *R. pyrenaica*.—*L. C. E.*

Rhododendron argyrophyllum var. **leilandrum**. By J. Hutchinson (*Bot. Mag.* t. 8767; 1918).—Native of Western Szechuan. A very hardy but slow-growing species. The leaves are green and glabrous above, covered beneath with a white mealy indumentum, everywhere except on the midrib. The flowers are rose-coloured, the corolla tubular campanulate about $1\frac{1}{2}$ inches across.—*L. C. E.*

Rhododendron brachyarthum Franch. By J. Hutchinson (*Bot. Mag.* t. 8750; 1918).—Native of Yunnan. A neat *Rhododendron* discovered by Mr. G. Forrest. It is quite hardy in this country, if grown in partial shade. The calyx is large and rather leafy, flowers pale yellow, with the corolla tube wide campanulate.—*L. C. F.*

Rhododendron orbiculare Decne. By J. Hutchinson (*Bot. Mag.* t. 8775; 1918).—Native of Szechuan. A very distinct *Rhododendron*. Although quite hardy does not seem to thrive well in this country. The leaves are elliptic-orbicular, glabrous green above, glaucous and finely veined beneath. Flowers nodding, rose-carmine, corolla wide, campanulate $1\frac{1}{2}$ inches across.—*L. C. E.*

Rhododendron oreotrephe W. W. Sm. By J. Hutchinson (*Bot. Mag.* t. 8784; 1918).—Native of Yunnan. A handsome *Rhododendron* discovered by Mr. G. Forrest. The most striking feature of this plant is due to the bloom on the underside of the leaves. The flowers are usually rose, sometimes flushed with lilac or lavender. It has up to the present proved quite hardy, and in its native habitat attains a height of 25 feet.—*L. C. E.*

Rhododendron prostratum W. W. Smith. By J. Hutchinson (*Bot. Mag.* t. 8747; 1918).—Native of Yunnan. A dwarf *Rhododendron* from 2 to 4 inches high, perfectly hardy in this country as far as winter cold is concerned, but it has not yet been seen whether its flowers will escape the late frosts. The flowers are borne in terminal umbels of 1 to 3 flowers; calyx large, yellowish-green; corolla very wide funnel-shaped, pinkish-violet.—*L. C. E.*

Rhododendron siderophyllum Franch. By J. Hutchinson (*Bot. Mag.* t. 8759; 1918).—Native of Yunnan. A species closely allied to *R. Davidsonianum*, from which plant it differs in its more densely glandular leaves, the under surface of which in consequence has a rusty and rather dirty look. Up to the present *R. siderophyllum* has proved quite hardy in this country. The flowers are rose-coloured, slightly two-lipped, with red blotches at the back of the corolla tube.
L. C. E.

Rodent Pests, The Control of. By Charles J. Sorenson (*U.S. Exp. Sta., Utah, Circ.* 20, March 1918; 2 figs.).—This circular contains directions for killing ground squirrels, pocket gophers, rabbits, and field mice. The formulae recommended for the destruction of the latter pest are:—strychnine (sulphate) 1 oz. chopped alfalfa leaves 30 lb., hot water 2 gallons; dissolve the strychnine in the hot water and sprinkle it over the alfalfa, previously moistened with water, mix thoroughly. Put the bait in small quantities, about a teaspoonful to a place, along the mouse runs and at the entrances of their burrows. Field mice are active throughout the year, and feed night and day. The above method of destruction is for winter use.—*V. G. J.*

Rose Leaf-hopper, Life-history and Control of the. By Leroy Childs (*U.S.A. Exp. Sta., Oregon, Bull.* 148, Feb. 1918, 10 figs.; 1 plate, and charts).—The Rose Leaf-hopper (*Empoa rosae*) is an apple pest, occurring in the Pacific North-west. It feeds entirely on the under surface of the leaves, causing mottling and yellowing of the foliage. It does not, as has been supposed, feed upon the fruit: 92.7 per cent. of its over-wintering eggs are deposited in the canes of the rose. There are two generations a year, and the preference of the rose as an egg depository offers a medium by which this insect can be kept under control.—*V. G. J.*

Scabiosa Hookeri C. B. Clarke. By J. Hutchinson (*Bot. Mag.* t. 8774; 1918).—Native of Eastern Himalaya and Western China. An attractive plant of about 1 foot in height. The leaves are 6 to 8 inches long, somewhat tufted and very hairy. The flower heads are borne singly and slightly drooping. The flowers are pale violet, with dark purple anthers. So far this species has proved to be quite hardy.—*L. C. E.*

Sophora japonica Linn. By W. J. Bean (*Bot. Mag.* t. 8764; 1918).—Leguminosae. Native of China. One of the most ornamental of hardy trees, flowering in September. Trees, however, do not as a rule flower until they are thirty to forty years old and seldom develop seed in this country. The leaves are deciduous, alternate, imparipinnate 6 to 10 inches long, dark glossy green above, glaucous and furnished with adpressed pubescence beneath. The flowers are borne in terminal, pyramidal panicles 4 to 8 inches high, creamy white.—*L. C. E.*

Sorrel, Red, and its Control. By F. J. Pipal (*U.S.A. Exp. Stn., Purdue, Bull.* 197, vol. xix. Dec. 1916; 15 figs.).—As a rule, an abundance of red sorrel in a field indicates acidity, insufficient organic matter, mineral plant food, or bad drainage; in other words, the soil is "sour." Any of these conditions is harmful to the development of the crops, while it does not interfere seriously with the growth of red sorrel. Consequently the latter grows and smothers the crop.

Red sorrel can be eradicated and prevented from seeding by one or more applications in form of fine spray, of 20 per cent. solution of sulphate of iron. Spreading salt liberally over infested patches will prove effective, especially in pastures.

It has been claimed that red sorrel is relished by stock. Although it is best to eradicate it as soon as practicable, it may be worth while, when found in abundance on a farm, to utilize it for feed.—*V. G. J.*

Spraying, Dusting as a Substitute for. By H. H. Whetzel and F. M. Blodgett (*Proc. 16th Ann. Meet. N.Y. Fruit Growers' Assoc.*, March 15, 1917; pp. 61-75).—A summary showing the advantages from a fungicidal point of view of dry spraying over wet, seeing that sulphur is the agent left, after lime-sulphur spraying, for combating the scab spores.

The results were disappointing, but the faults were attributed to (1) inexperience in dusting as compared with spraying, (2) the coarseness of sulphur used, (3) failure to appreciate the greatest advantage which dusting has over spraying, *i.e.* the possibility of making timely applications, and (4) the dusting machinery is much less perfected than is spraying machinery. It is urged that dusting be continued and the faults remedied, *e.g.* the sulphur to be ground finer, timeliness of application studied, and that manufacturers improve the machines, especially the feed control and distributing tube.—*G. F. W.*

Stewartia serrata Maxim. By W. J. Bean (*Bot. Mag.* t. 8771; 1918).—Ternstroemiaceae. A small hardy tree, probably native of Japan. The leaves are deciduous, elliptic or obovate with the margin serrate and teeth incurved, dull dark-green and glabrous above, paler beneath and pilose on the midrib and in the axils of veins. The flowers are solitary in the leaf axils of young shoots 2 to 2½ inches wide, cream-coloured stained with red on the outside. In the absence of seeds it can be easily propagated by cuttings made of fairly firm wood, in July and August.—*L. C. E.*

Stewartia sinensis Rehd. et Wils. By W. J. Bean (*Bot. Mag.* t. 8778; 1918).—Ternstroemiaceae. Native of Western China. A small deciduous hardy tree. It was first distributed under the name of *S. monadelpha*, from which it differs in having much larger capsules. The leaves are usually oval, bright green on both surfaces. The flowers are solitary, white, about 2 in. wide.—*L. C. E.*

Storage Houses, Management of, for Apples. By H. J. Ramsey and S. J. Dennis (*U.S.A. Dep. Agr., Farm. Bull.* 852, June 1917; 4 figs.).—This bulletin, deals with the construction and efficient management of apple stores.—*V. G. J.*

Sugar-Beet Syrup. By C. O. Townsend and H. C. Gore (*U.S.A. Dep. Agr., Farm. Bull.* 823, May 1917; 9 figs.).—Describes growing of sugar beets in the garden, and a simple process of making them into a palatable and nutritious table syrup. The beets are cut into thin slices, soaked in hot water to extract the sugar. The liquid is then boiled until the requisite thickness of syrup is obtained. Generally speaking, a bushel of well-grown roots will produce from 3 to 5 quarts of syrup.—*V. G. J.*

Strawberry, Sterility in. By W. D. Vallieau (*Jour. Agr. Res.* xii. p. 613, March 1918; plates).—An important contribution to our knowledge of sterility in strawberries. The wild American species of strawberry are mostly dioecious, but the cultivated hybrids are usually more or less hermaphrodite. High percentages of abortive pollen grains are, however, produced, though some normal functional pollen grains occur, and there is no evidence of physiological self-sterility. The development of the pollen grains has been followed and is

illustrated. The author considers the "varying rates of growth, time of microspore division, ability to increase the cytoplasm, and inability in many cases to develop normally, seem to be the outward expression of the differential ability of these new chromosome combinations to carry on cell metabolism."

F. J. C.

Symbiosis, Possible, between Legume Bacteria and Non-leguminous Plants?

By Thos. J. Burrill and Roy Hansen (*U.S.A. Exp. Stn., Illinois, Bull.* 202, pp. 111-181; 17 plates).—The authors state that the nodule bacteria studied were found to be true Schizomycetes, actively motile by means of a single polar flagellum, but the nodules of the non-Leguminosae *Ceanothus*, *Cycas*, *Alnus*, and *Myrica*, which are said to be concerned with fixation of atmospheric nitrogen, are not caused by *Pseudomonas radicola*. The nodules of *Ceanothus* are wholly different morphologically from those of the Leguminosae. The evidence as to the dissimilarity of the nodules of *Elaeagnus* and *Podocarpus* caused by these organisms is not conclusive, nor is the proof of the fixation of nitrogen conclusive. The preliminary experiments of attempting the infection of non-Leguminosae with nodule bacteria failed.

The adaptations of the nodule bacteria are constant. Such factors as acidity or alkalinity of the medium, the use or absence of organic or inorganic substances in the medium, or the presence or absence of combined nitrogen in the medium, do not affect the virulence nor break the special adaptations.

A full bibliography is appended.—A. B.

Tobacco Beetle, The: An Important Pest in Tobacco Products.

By G. A. Runner (*U.S.A. Dep. Agr., Bull.* 737, March 1919; 16 figs., 9 tables, 14 plates).—This beetle (*Lacioderma serricorne* Fab.) feeds and lives mainly in dried vegetable products, and is a most destructive pest of manufactured tobacco and tobacco products. It must not be confused with a field insect, *Epitrix parvula*, which attacks growing tobacco.

The injury caused by the tobacco beetle is very great, owing to its habit of occupying its food substance during all stages of its life. The principal damage is done during the larval stage. The presence of refuse, excrement, dust, and dead beetles renders the manufactured product unsaleable.

Cigars and pressed tobacco are injured by the insect burrowing small cylindrical tunnels, which later become filled with dust and excrement. A large portion of the interior of cigars may be destroyed without external evidence of injury to the wrapper. Injured cigars do not draw well, burn unevenly, and dust is drawn into the smoker's mouth. Among destructive agencies employed in the control of the insect are:

1. High temperature or steam (a temperature of from 125° to 140° F. continued for several hours, or 150° F. for a short time) kills all stages of the beetle.

2. Treatment by cold storage.

3. Trapping or destruction by mechanical means.

4. Fumigation with carbon-bisulphide, hydrocyanic gas, or other fumigants.

5. Sterilization of infected tobacco by means of exposure to Röntgen or X-rays.—V. G. J.

Tomato as a Farm Crop for the Canning Factory, The.

By C. G. Woodbury and H. J. Reid (*U.S.A. Exp. Stn., Purdue, Circ.* 59, March 1917; 13 figs.).—Tomatoes respond to thorough cultivation and growers should give them all possible attention. The yield may be easily reduced several tons per acre by neglecting the crop at critical times. No larger acreage should be set than can be well cultivated. This circular deals very thoroughly with all points of culture on a large scale, and gives formulæ for the control of insect and disease troubles.—V. G. J.

Vegetable Evaporation (*Bull. State Comm. Hort., California*, viii. 3, March 1919; 24 figs.).—Contains many interesting papers, including one on "The Evaporation of Vegetables." Experiments by biological chemists show that all green vegetables contain a substance they call vitamin, which is necessary to the growth of young animals and children. It is thought that drying the vegetables does not destroy this compound. The weight of evaporated vegetables is $\frac{1}{10}$ to $\frac{3}{10}$ that of canned vegetables, and the process is much cheaper. They are easily prepared, and keep well if stored in tins or air-tight cases.—V. G. J.

Weeds, Whitlow Peppermint, and Black Mustard, Control of. By R. Robson, M.Sc. (*Jour. Bd. Agr. vol.* xxvi. No. 1, April 1919).—A descriptive and illustrated article on the two above-mentioned weeds. Whitlow Peppermint

(*Lepidum Draba*) is said to have been introduced into Thanet in 1809, and has since spread over Kent and Essex, becoming a pest which has hitherto been difficult to eradicate, partly owing to the depth to which the rootstocks will penetrate. Some have been traced to a depth of 4 feet, and both the usual treatment for couch-grass and hand-weeding have only kept it in check. Mr. Robson has conducted experiments by which it would appear that the weed can be controlled by two annual sprayings, about May, with a mixture of copper sulphate and either nitrate of soda or sulphate of ammonia, when fields are being cropped with oats or other grain.

Black Mustard (*Sinapis nigra*) was controlled in the same way. Some scorching of the oats occurred, but this was only temporary. The effect of the fertilizer used in conjunction with the blue vitriol was to stimulate the growth of the grain.—G. C. G.

Wilt Disease of Okra and the Verticillium Wilt Problem. By C. W. Carpenter (*Jour. Agr. Res.* xii. pp. 529-546; March 1918; plates).—Two similar diseases of okra, caused respectively by *Fusarium vasinfectum* and *Verticillium albo-atrum* are described. Both are vascular parasites and are capable of persisting for a long time in the soil. The treatment recommended is to save seed only from healthy plants, and in extreme cases to soak seed in formalin (1 part to 240 of water) before sowing. Not only is okra attacked by *V. albo-atrum*, but also egg-plant, potato, cotton, Antirrhinum, Xanthium, Abutilon, ginseng, China aster, and black raspberry.—F. J. C.

Wireworm: Mustard-growing as a Preventive. By J. C. F. Fryer (*Gard. Chron.* Feb. 8, 1919, p. 54).—Relates success on a farm in the East of England where a first crop of Mustard on infected land has been followed by good crops. When there is no other food wireworms may attack Mustard, but they eventually die out, perhaps from starvation when it is grown as seed-crop, perhaps when ploughed in, from some injurious substance set free in the decomposition.

E. A. B.

Yield, New Place Effect in Maize. By G. N. Collins (*Jour. Agr. Res.* xii. pp. 231-243; Feb. 1918).—Hybrids made at different localities showed increased yield as a result of transferring to a new locality, the change appearing to act as a stimulus.—F. J. C.

Yields of Fruit Trees, Relation of Variability of, to Accuracy of Field Trials. By L. D. Batchelor and H. S. Reed (*Jour. Agr. Res.* xii. pp. 245-283; Feb. 1918).—The authors point out that one of the main factors in causing differences in yield of fruit trees is lack of uniformity in soil. They found that a single plot of 32 trees gave far less reliable results than four 8-tree plots scattered irregularly over an experimental area, and they recommend this standard for cultural experiments, and for rootstock, pruning, and variety experiments, twice as many plots of half as many trees. The probable error of results of various groupings of trees is given.—F. J. C.

Zanthoxylum planispinum Sieb. et Zucc. By W. J. Bean (*Bot. Mag.* t. 8754; 1918).—Rutaceae. Native of Japan. A bushy shrub of 6 to 12 feet in height, branchlets almost glabrous, armed with a pair of spines at each node. The leaves are semi-persistent or deciduous, 3 to 10 inches long, unifoliate, trifoliate, or pinnate with five leaflets. The flowers are greenish, very small and inconspicuous. The fruits are red, about $\frac{1}{2}$ inch wide and contain one shining black seed.—L. C. E.

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OAKS AT ALDENHAM.

By the Hon. VICARY GIBBS, F.R.H.S.

JUST seventeen years ago, namely, in 1902, I was in Dresden. Having heard of a fine tree nursery some thirty miles to the east, at a place called Muskau, I made an expedition through the pine woods on a little single line of rails to visit it. I found there, among other interesting trees, a great many out-of-the-way oaks, and, knowing how well our heavy London clay suits this genus, I secured a number of them. These have been planted near the house along a succession of rides in a young wood, which was at that time just being started. As they have now been in their new quarters long enough for one to be able to make a fairly confident prophecy as to their prospects, it may interest Fellows of the Royal Horticultural Society to have some account of them and other trees of the same genus coming at various times and from various quarters to adorn the arboretum, and to know which species have thriven on a cold heavy soil and which not.

Although arboriculture is in much greater vogue than it was when I first started to collect what an unsympathetic relative spoke of as "Vicary's silly bushes," yet oak-growing is necessarily such a slow business that any comprehensive gathering of the order Cupuliferae* is still, and is likely long to remain, a rarity.

Setting aside the wonderful show at Kew as *hors concours*, the only striking assortment of exotic oaks outside our own with which I am

* I see no advantage in abandoning BENTHAM and HOOKER's name (1880) in favour of Fagaceae, which the German writers ENGLER and PRANTL coined nine years later, in order to cover the tracks of their dependence on previous workers, and to give an air of originality.

well acquainted is that belonging to my old friend Lord DUCIE at Tortworth, who must be the oldest living arboriculturist, and who, though aged ninety-one, is still, I am glad to think, able to go about among his treasures and retain his interest in them. As CLAUDIAN, a late Roman poet, expresses this idea :

" Ingentem meminit parvo qui germine quercum,
Acquaeuvmque videt consenuisse nemus ! "

which when rendered into English verse by COWLEY becomes :

" A neighbouring wood born with himself he sees,
And loves his old contemporary trees."

There the specimens are far older and larger than mine, and two can be seen, viz. *Quercus cinerea* and *Q. glauca*, which I have not the good luck to own at all. Nevertheless the Aldenham collection, in so far as concerns the mere number of different species and varieties of oaks represented, is far the more complete of the two.

It will at once be noticed that my accounts of trees are not couched in orthodox botanical jargon. It is true I do not go the length of Mr. ROBINSON, who would like to see all plants called by English names ; for, to begin with, there are no English names for numbers of plants, including all the more recent introductions. They would have to be invented, and who could guarantee their general adoption ? Again, there would arise constant confusion, owing either to the same plant having different names (the ' Lad's Love ' of Lancashire is ' Old Man ' in the South), or to terms like ' Bridal Wreath,' or ' Love in a Mist,' or ' Devil in a Mist,' or ' Dog in a Blanket ' being applied in one place to one plant and in another to another. This I can illustrate by telling how I was lately taken in myself. A friend was going round the garden and remarked " I don't see the Red Gum here. It is so beautiful and does perfectly well in Scotland." I replied " You can't mean *Eucalyptus rostrata*, for that is exceedingly tender." Still I made sure that he was talking about some hardy Eucalypt with which I was unacquainted, and told him I should be delighted to have it. When it arrived it proved to be an *Arbutus* ! or, to use popular language, a ' Strawberry Tree '—a name that is quite as often applied to a representative of a totally different genus, *Benthamia fragifera*, which belongs to the Cornus family. Take again the case of *Acer Pseudo-platanus* : in England this species of maple is popularly known as a Sycamore, and among Scots as a Plane, there being grave objection to both these names. Further, some popular names are founded in error and tend to disseminate it, e.g. ' Mountain Ash.' A clever but uneducated old gardener once announced to me his intention to graft a fine form of this on some young Ashes which had sown themselves in the garden, and I had some difficulty in convincing him that he might as well try and graft them on the tail of his coat. Had he been accustomed to regard one as a *Pyrus* and the other as a *Fraxinus*, he would not have been tempted to try and amalgamate them. It

is also a fact that some years ago, in the then most famous of English nurseries, their propagator was found engaged on the fruitless task of grafting the Wych Hazel (*Hamamelis*) on the common Hazel (*Corylus*). Perhaps the worst conceivable type of nomenclature is where, as in the case of the popular and flower-shop use of *Syringa*, the scientific name of one genus, the Lilacs, is perversely applied to another, viz. the *Philadelphus* or 'Mock Orange.' There is not the excuse of *Philadelphus* being one of those outlandish jaw-breaking words which occur in botany, for, owing to the occurrence of a similar name in the Bible, and in Pennsylvania, one would have thought that it was fairly familiar to all.

Though I can see great advantage in having generally-accepted scientific names for plants themselves, I can see none in English and American botanists using Latin and Greek words to describe the shape and other characteristics of those plants, where there is no gain in precision, and, to many, a sad loss of intelligibility. I realize the commercial advantage to the medical profession of veiling their prescriptions in the obscurity of a dead language, and indeed *Fiat haustus* may have an actual curative effect by suggestion, and by arousing in the patient a sense of increased confidence in the learning and wisdom of the leech. Why, however, should a botanist desire to prevent a zealous, if imperfectly educated, gardener or amateur from understanding his descriptions? There is much to be said for writing scientific treatises in Latin, and so appealing to men of culture out of every nation, but nothing that I can see for writing English heavily "maculated" with Greek and Latin. Who is the gainer by reading a farrago like the following?—

"*Dalopsis Jacksonae*.* An arborescent caryotaceous stoloniferous glaucous plant, with a ramose divaricate head, and glabrous rubiginose subfuscous cortical parenchyma; coriaceous pilosiusculous foliage of dolabriform or clypeate shape, cuneate base, and mucronulate lobes, having ciliate or fimbriated margins, and abbreviated petioles, xanthous coloration marmorated with ochroleucous maculations, a verrucose and psoralaceous superior surface, the inferior being covered with inspissated farinose tomentum, and coarctate capillary filaments; producing dehiscent hippocrepiform legumes, and elongated cinereous sericeous propendent aments."

I really do not think that the above is an unfair burlesque of some of the esoteric mysteries into which I have been privileged to penetrate while reading up for this article, and which recall the character in "Love's Labour's Lost," who had "been at a feast of languages and stolen the scraps." Glowing with the pride of composition, I can almost persuade myself that, with a small magnifying glass screwed into one eye, I might pass for a botanist myself. Now let us compare a literal translation of the above, and it will be found

* The generic name is an attempt to emulate the literary grace of blending two different languages in one word, as in "*Prunopsis*," "*semecarpifolia*," and other botanic names; the specific one faithfully reproduces a comical modern effort (which would have been absolutely unintelligible to anyone whose tongue was Latin) to indicate that it is not Jackson but Jackson's wife whom it is desired to immortalize.

that, confined to simple English understood of the people, it yet takes no more space, and gives even to the learned quite as clear a likeness of the supposititious plant :

“ A plant belonging to the Dates, which tends to make a tree, reproduced by runners, growing on gravel, with a straggling branchy head, and smooth rust-coloured brownish bark, with flattened cells ; leathery slightly hairy leaves shaped like a hatchet or a shield, with wedge-shaped base and lobes ending in a sharp point, having hairy or fringed edges, and short stalks, yellow colour marbled with yellowish white spots, a warty and scurfy upper side, the under covered with thickened mealy down, and hairy threads pressed together ; bearing gaping horseshoe-like pods, and long grey silky catkins hanging forward.”

Should any reader be curious to discover how much of this paper is original and how much copied from others, he will be safe in assuming that when there is an outburst of Greek, Latin, and latinized words, I have been “ cribbing,” even though vanity may have led me to pass myself off as a man of science by suppressing the quotation marks.

Being an old man approaching seventy I will cease to kick up my heels, like a young colt, at botanists, and, leaving them justly to attribute my flouts and jeers to envy of their superior acquirements, will now proceed to business. If anyone should think that my caricature is too grossly exaggerated, let him read of the “ dorsifixed extrorse ” anthers, and “ peripheral reticulate membranous ” wing, &c. &c., in the description of *Ulmus* by an eminent living friend of mine.

I will give in alphabetical order a short account of the oaks at Aldenham, together with some half a dozen which, though not there, ought to be there, and if all goes well will be there in a few months, following always the nomenclature adopted by Kew.

Quercus acuta (Thunberg).—I have only two small examples of this pleasing, slow-growing, shining evergreen ; like other Japanese oaks, and particularly *Q. glabra*, to which it has a general surface resemblance, it is never likely to make more than a shrub in England. So far my plants have progressed satisfactorily, but I have not had them long enough to speak very positively. Its first appearance in England dates from 1877, and is due to the well-known Veitchian collector MARIES, who was born at Warwick-on-Avon, though his name suggests a French origin. The best specimen which I have is 3 ft. high with a spread of 3 ft., but there is one to be seen at Bicton, in Devon, 12 ft. high with a spread of 18 ft. When I mention that in February of this year we had the misfortune to register 33° of frost, the lowest temperature since January 1895, when there were 35°, and record the fact that this species came through the ordeal unscathed, not so much as a leaf being scorched, I think it may fairly be classed as absolutely hardy.

Q. Aegilops (Linnaeus).—I am entitled to count this among the oaks of which Aldenham can boast, but that is the utmost I can say, for my own example of the Valonia oak is only 7 ft. 6 in. high, and though shapely and healthy is not yet sufficiently developed to

enable me to give at first hand a useful account of the appearance or characteristics of this species—indeed, if I were not better acquainted with others of the genus than I am with this, this paper would not have been written, and assuredly would not have been worth reading. It is unlucky for me that it should take so prominent a place in alphabetical precedence.

It is a deciduous tree found in Greece, the Levant, and the Mediterranean region. The acorns, which are edible and rich in tannin, are exceptionally large. According to LOUDON, it was introduced into this country as far back as 1731, but has never become common, and Mr. ELWES mentions no tree which he had seen that had attained 50 ft. The only specimens with which I am familiar are those at Tortworth and Kew; the former is about sixty years old, and certainly under that height. I carefully examined this specimen in April last, and it showed a good deal of dead wood, and did not suggest a superabundance of vigour. The Kew plant is from 25 to 30 ft. high, but has never yet borne acorns. I doubt very much if our Hertfordshire climate will prove warm enough for it ever to make a pronounced success, but in arboriculture I adopt ST. PAUL'S precept, "Prove all things," and, as far as I can, the conclusion of the same sentence, "Hold fast that which is good."

Q. agrifolia (Née).—This oak, like *Q. acuta* above mentioned, is not often likely to prove more than an evergreen shrub in this country. It is a native of California, and, owing to the fact that it affects the sea-coast, was the first Western American oak to be brought to England, an event which occurred in 1849. It is one of the holly-leaved set of oaks, of which the European *Q. cocciifera* is to my mind a more attractive example. It is common enough in its own habitat, but very rare here; indeed, twelve months ago it was not represented at Aldenham. Recently, however, I have had to thank Lord DUCIE for a plant 5 ft. 6 in. high, with a single stem, which looks as if with care it might in time make a fair tree. I am also indebted to Sir DAVID PRAIN, the able Director of our national collection, for two smaller ones of a more bushy type, which are 2 ft. 6 in. and 2 ft. high respectively.

It is not, however, only to the present Director of Kew or to those of Edinburgh and Glasnevin that I have cause for gratitude, though that cause is great, but long ago, when I was but a beginner, and had nothing to offer or give in exchange, I used to receive help, encouragement, and gifts in the shape of surplus plants, unobtainable in commerce, from Sir WILLIAM THISELTON-DYER, and he did not hesitate to give up some of his valuable time for the purpose of escorting me about the Kew grounds, a source of the greatest pleasure and profit to me. I hope these lines may meet his eye, as he will then realize that with me at any rate gratitude is not merely what it has been cynically described as "A lively expectation of favours to come." Nowadays, and for a fair number of years, I have accumulated from various sources so many rare young plants that I feel pride in my

annual ability to do something to improve our three great National Botanic Gardens. I do not wish to suggest that I am in a position to treat, as the Spaniards say, *de poder a poder*, but at least my relations with them are no longer "all take and no give."

To return to *Q. agrifolia*. This when fully developed in its native land is a ponderous tree, and commonly so low that the spread of its branches exceeds its height. The bark is dark, and except in old trees smooth; the oval or oblong leaves are not so leathery as those of *Q. Wislizenii*; the long, narrow, pointed, tapering acorns, which are marked with conspicuous lines, are sessile, and develop in one season. A clear and faithful drawing of a flowering branch is reproduced on Plate V. in "West American Oaks" by Professor E. L. GREENE (1889). I hardly see that it has any special merits which make it greatly worth cultivating by anyone who grows plants merely for ornament and is not a collector of different species as such. The Kew specimen is about 35 ft. high, and I presume about twice that number of years old, and it will be no great hardship for most people to have to content themselves with looking at it there without attempting to grow it in their own gardens.

I had written the preceding sentence without recalling a tree and not a shrub of this species which is growing in the grounds of my friend, Major GILBERT LEGH, at the Drove House, Thornham, Norfolk. The leaves of the Thornham specimen are nearly half as big again as those of the Kew one, and are distinctly handsomer. The tree, which must have been one of the first introduced into England, is ill-grown, being dominated by pines and other trees which overshadow it, and the stem has a curious corrugated appearance, the bark having formed a succession of shell-like rings, which feature is, I am told, typical of this species in age. I leave unmodified what I had written when overlooking this finer form, for it may serve as an illustration of the error to which we are all too prone—I mean, of basing a confident estimate of the appearance, vigour, and other characteristics of a species on insufficient data, namely, the behaviour of one or two plants which happen to be intimately known to us but which may not be truly typical.

Q. alba (Linnaeus).—For some unknown reason this fine timber tree, like so many others whose chief habitat is the eastern side of North America, has hitherto never thriven in the British Isles. Mr. BEAN, in his deservedly popular "Trees and Shrubs Hardy in the British Isles," expresses an opinion that there is not one existent over 25 ft. high, and so far as Aldenham is concerned I can bear out his statement, for my two tallest plants are respectively 18 and 14 ft. in height. Messrs. ELWES and HENRY, also, in their monumental work, "The Trees of Great Britain and Ireland," having visited me while it was in course of production, write in 1910, on p. 1303, of "some plants at Aldenham, with sickly yellow foliage, planted eight years ago." Though at the time they fully deserved this depreciatory comment, it is very remarkable, having regard to the bad European

record of this species, that now eight years later they should be in robust health. It can be seen from the photograph taken early in December, with the dying foliage still adhering to the branches, that this tree, which though the taller is by no means the better of the two, is neither ill-grown nor in bad case (fig. 15).

This species holds its leaf very late, at any rate so long as the trees are young. I noticed mine in the last week of last January and hardly a leaf had fallen, though all the other deciduous oaks were bare, except *Q. ellipsoidalis* and *Q. rubra*, which still retained some of their foliage. Neither in Mr. ELWES' nor Mr. BEAN'S books are any varieties of the white oak recorded. It is true that I have an oak bought from a German nursery which purports to be a variety of *alba*, "Schönbusch," but, as far as I and better-qualified friends can judge, it bears no relation to that species, the leaves are much smaller, of a greyish colour, and have much more sharply toothed edges. It is in excellent health, 13 ft. high, and the only respect in which it resembles *Q. alba* is that the foliage was still clinging to the branches at the end of last January. Besides this variety I have also a hybrid, *alba* × *macrocarpa* (*Q.* × *Bebbiana*)—in fact, several—all of which have been given me by Professor SARGENT. The two tallest are 10 and 9 ft. high respectively. This hybrid is mentioned in "Trees of Great Britain" in the article on *Q. macrocarpa*, and it is there stated, in note 1, on p. 1305, to grow faster than either parent, a fact borne out by our experience at Aldenham. The parent of my plants is, I imagine, a natural hybrid oak growing at Charleville, Vermont, which is referred to in the above-mentioned note.

Q. aliena (Blüme).—My best specimen of this deciduous Chinese oak is only 4 ft. 6 in. in height, but I am the fortunate possessor of a good healthy plant of the variety *Q. aliena acutiserrata*, which reaches 7 ft. 6 in. and gives every promise of making a fine forest tree. I also had at one time another variety, *Q. aliena acutiserrata calvescens*, but this has unkindly "died on me," as the Irish say.

Both type and varieties are practically unknown in European cultivation, and are consequently passed over in silence both by ELWES and HENRY, and by BEAN. For an account of them I must refer my readers to "Plantae Wilsonianae," vol. iii. pp. 214-6, where, however, the descriptions, though doubtless very learned, do not enable the ordinary unscientific man to form much idea of the appearance or characteristics of the trees, *e.g.*, happening to possess some of this species, I am able to say that the foliage is not persistent, but I can find no mention of this not unimportant feature in the three pages above referred to. I suppose that the author assumes a far greater knowledge in his readers than I at any rate am fortunate enough to possess.

Q. alnifolia (Poech), Golden Oak of Cyprus.—This small evergreen tree, or rather shrub, is found as undergrowth in the pine woods in the mountainous parts of Cyprus. It was first brought to England in 1885, and neither Mr. ELWES' nor Mr. BEAN'S accounts disclose

any other place in this country except Kew where it is to be seen. I wish I could truthfully say that it was at Aldenham, but though I am taking steps to have it grafted, it is at the moment one of the few oaks which I lack and greatly desiderate. I don't know this species well enough to say much that would be of value, but one marked feature seems to be that the leaves are practically as broad as they are long, they measure from $1\frac{1}{4}$ to $1\frac{1}{2}$ in. both ways. The rich orange down which covers their under side gives it its popular name, and is of almost precisely the same shade as that which adorns the foliage of the Himalayan *Q. semecarpifolia*. I copy from Dr. HENRY'S botanical account the statement that they are "rounded or acute at the apex; rounded or broadly cuneate at the base."

When trees are so inconstant in their leaf production that learned men have to tell you that they are either long or short, either round or square! the power of the earnest student to visualize the foliage in question is not materially increased.

Q. ambigua (Michaux).—Some ten or twelve years ago I was staying with my friend Monsieur MAURICE DE VILMORIN, whose recent death so many have cause to deplore, at his charming country place Les Barres, near Orleans. One day he took me over to see some interesting woods which had been planted by his father with exotic trees, and which had at a later date been acquired by the French Government for their School of Forestry. A considerable section had been devoted to this oak, and very fine well-grown trees they were, so far as I can remember, about sixty years old.

Not feeling that I was robbing our future gallant Allies by my action, I filled one of my pockets with the acorns, and getting home about a fortnight later had them sown; they had by that time become rather dry and shrivelled, and, as many of my readers will be aware, the less delay between gathering and planting in the case of acorns the better. However, a fair proportion germinated and have now produced some good strong plants, of which the tallest is 12 ft. high. The parents of this oak are believed to be *rubra* and *coccinea*, the former being the mother, and there is nothing in its looks to throw doubt on such a pedigree. Some botanists, however, have held it to be a distinct species, and I am not competent to express an opinion. If I had kept all the young plants which I raised together, and had then got Dr. HENRY or some other capable man of science to examine them, he would probably have been able to state decisively whether or not they bore evidence of mixed, and if so of what parentage; but I have only kept two, and the rest have been given away or otherwise disposed of.

Q. arkansana (Sargent).—I owe the possession of a small specimen of this rare North American deciduous oak to the kindness of the Director of Kew. It is now 1 ft. high, and apparently quite healthy. This species was first received at Kew in 1911, and its first introduction to Europe may be assumed to be little if at all anterior to that date. The only work in which, as far as I know, any account is to be found

of this oak is SARGENT'S "Trees and Shrubs," vol. ii. p. 121, and it is thence that the following description is drawn.

This species is a native of Hempstead County, Arkansas, where it is found in low woods at Fulton, and on rolling sandhills four miles north of that place. Though fairly common in that particular district, it seems quite local, and has not so far been discovered elsewhere. Unless drawn up by crowding in a forest it rarely attains a height of more than 12 mètres when standing in the open, and is therefore negligible from the timberman's standpoint.

The leaves are broadly obovate, slightly three-lobed or dentate at the wide apex, and cuneate at the base. The fruit is solitary or in pairs on stout glabrous very short peduncles. Acorns are 6 to 8 mm. long by 14 to 15 mm. across, their base only being enclosed in the flat cup. This species most resembles *Q. marylandica* (Muench.) in its leaves, and *Q. nigra* L. in its fruit.

Q. × audleyensis (A. Henry).—This is a hybrid oak, whose parentage has been pronounced somewhat doubtfully to be *Q. Ilex* ♀ and *Q. sessiliflora* ♂. It is growing at Audley End, in Essex, the seat of Lord BRAYBROOKE, and is, I imagine, at any rate as a fully developed tree, a unique specimen, though young progeny derived from it may be in existence. The only place where an account of it can be found is in "Trees of Great Britain," vol. v. p. 1291, and of that account this is a mere shortened *réchauffé*. For a botanical description I must refer readers to that admirable work. It is sub-evergreen, 86 ft. or more in height, and over 11 ft. in girth. Some of the leaves are entire, like those of *Q. Ilex*, and others lobed, after the manner of *Q. sessiliflora*, and the venation corresponds to that in both those species.

I neither have it, nor any oak resembling it at Aldenham, and my only excuse for mentioning it even perfunctorily in this article is that Professor BAYLEY BALFOUR has been good enough to have cuttings of it struck for me, and that I fully intend, if I can obtain wood, to have it grafted by the time these lines are in print. Plate 327 in Mr. ELWES' book shows a grand, well-balanced tree in winter time, and almost denuded of foliage; unfortunately, through lack of pruning in youth, the main stem has been allowed to fork at a height which appears from the picture to be about 12 or 14 ft. *Q. × Bebbiana* (= *alba* × *macrocarpa*), see p. 161.

Q. bicolor (Willdenow), Swamp White Oak.—This is another of the Eastern American White Oaks, which is very rarely to be seen in cultivation in England. The tallest of our specimens, acquired at the same time (1902) and from the same nursery (Muskau) as the above-mentioned *Q. alba*, is 17 ft. high, well grown, and apparently quite healthy, though Mr. ELWES writes: "None of the specimens which we have seen look very thriving." I cannot now recall what their condition was when Mr. ELWES paid me a visit and made notes of the oaks which he afterwards described in his book, but he appears not to have noticed our *Q. bicolor*, which were then labelled *Q. tomentosa discolor*.

Perhaps the feature by which this oak can be most readily distinguished is its very shaggy bark, which peels off the stem and hangs in longitudinal strips. Even in our young trees, of which the eldest is, I should say, barely thirty years old, this characteristic is already marked, and enables anyone to pick out *bicolor* from the others formally set at regular distances on each side of a path merely by glancing at the trunks. Besides the type I have two plants of 12 and 10 ft. high respectively, which are labelled *Q. bicolor var.*, but the varietal name, if it ever existed, has disappeared.

Q. bicolor × *alba*.—We have two young plants 6 and 5 ft. high of this interesting hybrid, which were given me five or six years ago, I believe, by my good friend Professor SARGENT of the Arnold Arboretum, to whom also I am indebted for some of the rare and recently discovered Chinese oaks, which will be referred to later. So far this hybrid seems to be quite happy in its English quarters, but it is too young for me to have any assurance as to its future.

Q. castaneaeifolia (C. A. Meyer).—This tree, whose home is in Persia, the Caucasus, and Algeria, has grown very well, and forms here a shapely plant 22 ft. in height with a girth of 1 ft. 6 in. at 3 ft. above ground level. This specimen is not recorded by ELWES and HENRY, though they mention a good many of the Aldenham oaks. I presume that it is not sufficiently rare in cultivation to make a plant, so small as it then was, worthy of record. It is, however, seldom to be found in British collections. The excellent photograph (fig. 16) for which it sat, or rather stood, to Mr. MALBY shows that it is now (1919) one of our pronounced successes in the way of oak cultivation. My next best specimen is of exactly the same height, 22 ft., but girths an inch less in the stem. Its long and rather narrow leaves, recalling the tree from which it takes its specific name, make it easily recognizable. It has proved perfectly hardy, and indeed I may say the same of almost every deciduous oak mentioned as growing here. There is not one which we have had for any time that I can name as having suffered damage from cold even in the severest winters, though some few may have been killed by this cause while still infants in the nursery, and others may have been a little damaged by late spring frost. When it is remembered that in February of this year we registered 1° below zero in the screen, it can hardly be said that they have not been thoroughly tested.

Q. Catesbaei (Michaux).—This small deciduous oak is named after MARK CATESBY, author of the "Natural History of Carolina," and is a native of North Carolina southwards to Florida and Eastern Louisiana. It usually attains 20 to 30 ft. in height, but occasionally 50 to 60 ft. The trunk rarely exceeds 2 ft. in diameter. The winter buds are $\frac{1}{2}$ in. long, pointed, and coated, especially towards the point, with rusty pubescence. The leaves on the cultivated plant at Kew are 5 to 7 in. long by 3 to 5 in. wide, and are very deeply lobed, after the fashion of the red oaks, having 2 to 4 deep lobes reaching two-thirds or more of the way to the midrib. When fully grown the leaves are thick,

rigid, and lustrous, having a paler colouring on the under side, which is glabrous, except for tufts of rusty hairs in the axils of the veins. In autumn they take on a brown or dull yellow colour before falling.

Perhaps as easy a way as any of distinguishing this oak from allied species, such as *Kelloggii*, *coccinea*, *velutina*, &c., is provided by its very short leaf-stalks, which seem never to exceed $\frac{3}{4}$ in., and are often only $\frac{1}{4}$ in. The acorns are usually solitary, oval, with full rounded ends and short stalks, and are about 1 in. long by $\frac{3}{4}$ in. broad. In its wild state this oak is often little more than scrub. My own plant, for which I am indebted to Mr. GERALD LODER, is but a tiny one, a few inches high, and was raised from acorns gathered by Mr. F. R. S. BALFOUR at the splendid oak collection of Mlle. IVOY, at Château de Geneste, near Bordeaux, in Oct. 1917; consequently I have had to depend upon my friends at Kew rather than upon my own powers of observation for most of the above account.

According to NICHOLSON'S "Dictionary of Gardening," *Q. Catesbaei* was first introduced into England in 1825, but it did not reach Kew until 1905, and I cannot learn that any trees of older date than this are now in existence in the British Isles.

Although they print an excellent plate of the leaf, yet in the letter-press Messrs. ELWES and HENRY only give a very perfunctory account of this oak, disposing of it in three lines, one of which, to the effect that it is not in cultivation in England, is now no longer true. I presume that its worthlessness from a timber point of view explains the scanty attention which they pay to it. Indeed, it is a grave question whether this oak is sufficiently distinct in general appearance from, say, *Kelloggii* or *coccinea* to be worth growing on this side of the Atlantic by anyone who is not a botanist or does not, like the writer of these lines, suffer acutely from the collecting mania.

It is all very well, even where climate and soil are not specially congenial, to make an effort to grow oaks with distinct and extremely handsome foliage such as *Q. marylandica* and *Q. semecarpifolia*, but in the case of *Q. Catesbaei*, which to the casual eye does not differ materially from half a dozen other North American oaks, and which is not likely in the end to make so fine a tree as any one of them, the only inducement for an ordinary man to grow it is that he will have a tree which is most unlikely to be possessed by any of his neighbours, not the highest or finest ambition of which poor humanity is capable. In the U.S.A. its popular name is the 'Turkey Oak,' but it has no resemblance to our Turkey Oak, *Q. Cerris*.

Q. Cerris (Linnaeus).—I have quite as many as I want of this common and quick-growing tree, which is too well known to need description, and which is no great favourite of mine. The wood is almost worthless, and even for firing is woolly and inferior. I have heard it said in its disparagement that even pigs won't eat the acorns, but this, I can answer for it, is a false charge, at any rate in the case of pigs who have to live on war rations. It is certainly a fast and generally a regular and symmetrical grower,

though, however large a size it may attain, it never approaches the pedunculate oak in majesty, and always looks to my eye a bit of a weed. This is, of course, merely an expression of my personal opinion or taste; and a very good friend of mine, and a first-rate judge of everything pertaining to trees, profoundly disagrees with it, calling it "a noble tree at its best." When I was much younger and knew even less about trees than I do now, I planted a double avenue of *Cerris* at Aldenham. They must now be just about forty years old, and have certainly done well. Careful measurement gives the height of one of the best as 70 ft., with girth 3 ft. high of 4 ft. 11 in. I know no other oak which would be likely to reach such dimensions in such a time in England, though several would easily do so in Massachusetts. Indeed, anyone who attempted to base his estimate of the age of trees in the U.S.A. on experience gained in England would find himself woefully out in his calculations. I well recall being in the Arnold Arboretum in the spring of 1914 and seeing pedunculates which I estimated at sixty years old, only to learn that in fact they were exactly half that age.

However, though development is so much more rapid in America, where, for one thing, there is never any hindrance from spring frosts, yet, as a set off, what Insurance Companies call the expectation of life is much shorter, and English oaks soon fall victims to one or other of the many plagues to which trees are liable over there, but from which so far they have proved immune in Europe. In both respects, rapidity of growth and liability to disease, the conditions prevailing in New Zealand are similar to those in the States.

Q. Cerris is rather disposed to variation, and in ELWES' book five varieties are recorded, though the authors do not as a rule concern themselves much with anything but species. The only variety there mentioned which I possess is *Q. Cerris variegata*, in which the leaves, though otherwise normal, are freely blotched with white. Our specimen is 10 ft. high, and calls for no remark except that, as is often the case with variegated plants, it is not so free a grower as the typical Turkey Oak. I have also a plant of another variegated variety, which we call *Q. Cerris* 'Fortress,' from the name of a place in our neighbourhood where it was found: it is not, like the last, in commerce, and has bright yellow instead of white variegation. Besides these we have three good-sized trees which came to me from the Continent as *Q. Cerris crispa*, but these have been pronounced by experts to be *Q. lanuginosa*, and will be dealt with under that heading.

We also possess an out-of-the-way Continental variety, *Q. Cerris karlsruhensis*, 17 ft. $\times$ 1 ft. The name occurs in a catalogue of Späth of Berlin, and my plant probably came from that nursery, with which I have often dealt in past years. I hope I am not disposed unfairly to depreciate my own country, but I must say that in my experience I have found a far larger variety of out-of-the-way plants, from which to select, in Continental than in British nurseries, always excepting Veitch's establishment at Coombe Wood, now, alas, no more. The

acorns of this plant are quite normal, and leave no doubt that the specific name is correct, but the leaves are very long, in some cases reaching 8 in., and are very shallowly lobed, so that the general effect is quite unlike that of a Turkey Oak; it is making a very handsome tree.

Q. Cerris laciniata is an extremely deeply-lobed form, the leaves being cut away right down to the midrib. We have two plants, of which the best is well grown, and stands 17 ft. 6 in. high.

In addition to these named varieties I have another good-looking young tree about 6 ft. high, with particularly attractive foliage, which is either a variety of *Cerris* or possibly a hybrid between *Cerris* and some other oak. It came to Aldenham as *Quercus castaneaefolia*, a name to which it has obviously not the slightest pretension.

Q. chrysolepis (Liebmann), Maul Oak.—This is one of the live oaks, as Americans are in the habit of calling the evergreen members of that family, and has besides the popular local name of "Gold Cup Oak"; it belongs to California. It is a curious and interesting fact that there should be about the same number of different species of oaks in the Atlantic and Pacific States of North America, and that in no case is the same oak to be found growing wild on both sides of the Rocky Mountains. In fact, the Western oaks seem to have more affinity with the European than they have with their Eastern congeners.

The Maul oak has an ashy-grey bark; the foliage is sometimes pale and glaucous, and sometimes bright shiny green, with yellowish pubescence underneath; the oblong entire leathery leaves have very short petioles; the large ovoid solitary sessile acorns take two years to mature; the wood is heavy and strong, but difficult to work. Though stately and majestic when it reaches such proportions, and carries, as it sometimes does, a great head of branches, 50 yards across, it is not commonly to be found as a large timber tree, even in its own habitat, whilst in the British Isles, to which it was first introduced in 1877, there is at present no evidence that it will ever become more than a shrub, and none is known to me to be alive now which exceeds twenty years of age. In fact, it varies greatly in size and character according to the altitude at which it is found. Mr. F. R. S. BALFOUR, who knows it well in its natural state, writes: "In the southern Sierra Nevada I have seen it covering immense areas with impenetrable thicket only four or five feet high, and in that region it ascends to 8,000 feet, becoming at last a small prostrate shrub with tiny leaves. Lower in the valleys it is a highly picturesque tree."

Besides the two small plants at Kew there are some growing on the hillside at Rostrevor, in the Mourne Mountains, and it is to their owner, Sir JOHN ROSS of Bladensburg, that I owe the presence of a small rather stunted plant at Aldenham, about 2 ft. high. He was inclined to attribute my plant to the sub-alpine form *vaccinifolia*, which is found at a higher altitude in the same districts as *chrysolepis*, but as it seems very doubtful whether *vaccinifolia* be truly a variety

of the latter, I prefer to call mine *Q. chrysolepis* till someone who knows more about the matter than I do has given a contrary opinion.

Q. cinerea (Michaux), Blue Jack.—This is a small deciduous tree related to, and in the style of, *Q. Phellos*. Many botanists have regarded it as nothing more than a variety of it. Its habitat, according to Dr. HENRY, ranges from North Carolina southward to Florida, and westward to the Brazos River, Texas. There is a good specimen, about 30 ft. high; which Mr. ELWES mentions as to be seen at Kew, but there seem to be grave doubts as to this being true to name, and there is none at Aldenham, nor, as far as I know, anywhere else in the British Isles, except Tortworth. It is not considered of sufficient importance by Mr. BEAN for him to include it in his "Trees and Shrubs," and in "Trees of Great Britain" no date, even approximate, is given of its first introduction into Europe, but I presume this must have occurred somewhere about the middle of the nineteenth century.

I have seen dried entire leaves from a tree in North Carolina which, except for their being palpably downy on the under side, looked to me exactly like those of the willow oak, and I know the specimen in the Tortworth Arboretum, which was planted in 1878, and is still under 20 ft. high with a girth of 18 in. The stem is only 3 ft. 6 in. high, and it then forms a bushy head. It has cankerous warty excrescences and is not a vigorous plant; indeed, it looks at a distance like an ill-grown *Crataegus*. Otherwise I know but little of this species at first hand, but I gather from Professor HENRY's account that the leaves are oblong-lanceolate, some 3 to 4 in. long by $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, entire, and with wavy margins; the ovoid, sessile, or sub-sessile acorns are about $\frac{1}{2}$ in. long, and ripen in one season. Professor BAYLEY BALFOUR has kindly had cuttings struck for me, and I also have grounds for hoping that plants may be sent me from America in the course of this year, and should these fail to materialize, I have made arrangements for having this and other rare species grafted next March, so that one way or the other *Q. cinerea* ought in 1920 to be numbered among "oaks at Aldenham."

Q. coccifera (Linnaeus), Kermes Oak.—This till last year was one of my "wants," but I then received some rooted suckers obtained from the big plant which is growing in Kew Gardens, where it appears to be unaffected by cold. It is, of course, too soon for me to be able to give any report as to how it is likely to thrive on the heavy clay at Aldenham.

This evergreen bush or shrub, for it can hardly be dignified by the name of tree, belongs naturally to the Mediterranean. It carries small, hard, prickly, shining, holly-like foliage, and presents a cheerful appearance. The solitary acorns are more than half-covered by the bristly hedgehog-like cups. Its popular name of the kermes oak is due to the fact that the kermes insect breeds on it and produces the famous scarlet dye which used to be of great economic importance, but which has of late years been superseded by other and cheaper products. It was well known at a very early date, and

three sprigs of it form the crest or cognizance of the Dyers' Company, whose arms were granted before the middle of the fifteenth century. It is mentioned both by CHAUCER and SHAKESPEARE, but in spite of the fact of its European origin, and that it has been well known for something like 500 years, and was introduced and cultivated here as early as 1683, it cannot be said to be at all a common tree in these islands.

In Canon ELLACOMBE's lifetime I was familiar with his plant at Bitton, near Bath, which must by now be 25 ft. high if no misfortune has befallen it; some half a dozen other specimens are recorded by Mr. ELWES. It is the commonest oak to be found in Syria, and Abraham's oak at Mamreh belongs to a variety of this species, to which the exceedingly ill-chosen name of *pseudo-coccifera* has been given: of this variety I also have one specimen, for which my gratitude is due to Sir JOHN ROSS of Bladensburg, whose climate in the beautiful Mourne Mountains I envy as much as a Christian can with propriety do.

Q. coccinea (Muenchhausen).—This is one of the most satisfactory of the American oaks when transplanted to an English soil and climate, but it is too well known to require any elaborate account of it here. My oldest tree is 33 ft. high, with a girth of 1 ft. 10 in. I have also two specimens of the variety *Q. coccinea splendens*, which was introduced by ANTHONY WATERER. As far as I can see, it only differs from the type in that its autumn colouring is exceptionally brilliant, and for this reason alone the tree well deserves a place in any collection, all the more that the lovely colour is retained in an ordinary season for many days before the leaves fall.

If, as is the case with many, I had but little space for tree-planting and could only spare enough for, say, six oaks, I should select, having regard to the distinct character as much as to the beauty of their appearance, the following: *Q. coccinea*, *Q. marylandica*, *Q. conferta*, *Q. Phellos*; and among evergreens, *Q. Vibrayeana* and *Q. acuta*, for the latter, if no handsomer, is indubitably hardier than *Q. glabra*.

Q. conferta (Kitaibel), the Hungarian Oak.—If one regards its shapely habit, stately rigid growth, or its showy, deeply-lobed foliage, this is to my mind as satisfactory an oak as anyone can grow, and is, as I have remarked in the last paragraph, one of the half-dozen which I should plant if I were restricted to that number. Although European in origin (from the S.E.), it does not appear to have been introduced into the British Isles till towards the middle of the nineteenth century. I have seen a good many specimens in various places on various soils, but cannot anywhere recall a shabby, ill-grown one, and that for an oak is high praise. I possess several young plants, of which the oldest and biggest is now (1919) over 25 ft. high, with a girth of 1 ft. 8 in. at 3 ft. above ground. I think fig. 17 will prove that I have not exaggerated its good proportions. Mr. ELWES records the existence of this plant at Aldenham in 1908, when it was of course much smaller.

It is allied to *Q. Toza*, and was at one time regarded as a variety

thereof, but it lacks the grey down or tomentum which is such a marked feature of that species. Professor HENRY states that the timber is practically indistinguishable from *Q. sessiliflora*, and fetches about two-thirds of the price of *Q. pedunculata*.

Q. crispula, see sub *Q. grosseserrata* and *Q. mongolica*.

Q. cuneata (Wangenheim), Spanish Oak, often known by one of its synonyms, *Q. falcata*.—My two specimens of the type are young plants not above 4 ft. high, which do not merit as yet any special account of them. I have, however, two well-established plants with varietal names added, viz. *Q. cuneata hypophylleos*, 18 ft. high with a girth of 11 in., and *Q. cuneata macrophylla*, 12 ft. high. The former variety occurs in old Continental catalogues.

Q. cuneata hypophylleos is exceptionally handsome, but beyond the fact that the leaves are much larger I confess that I cannot detect in them any marked divergence from the type. The foliage is markedly cuneate or wedge-shaped at the base, and fully justifies the name. I consider the tree as well worth growing; indeed, in foliage it is as conspicuous as any, unless it be *Q. marylandica*. It is strange indeed, having regard to the fact that the type was first introduced more than 150 years ago, that it should still be such a rarity that in 1910 Dr. HENRY wrote that he had seen none except at Kew and Aldenham.

As to *Q. cuneata macrophylla*, though our plant came from Muskau, generally a trustworthy place, I believe it to be nothing more than a common *Q. rubra*, so will waste no more time about it.

Q. cuspidata (Thunberg) is said to make a large tree in its own country, Japan, but shows no prospect of ever becoming more than a pleasing evergreen shrub at Aldenham; my plant at present is 2 ft. 6 in. high with a spread of 1 ft. 6 in. across. It has bright-green leathery leaves over 2 in. long. The acorns are stated to be edible, but I should doubt if these would ever be produced in this country. It was first introduced to Holland as early as 1830, but not to England till 1879; it is still extremely rare, and I think it quite likely that there may not be a dozen plants in existence here. It does not appear to have been one of the trees collected by WILSON, to whom ultimately I owe so many of my rarities, though I gather that it has been found in Central and Southern China. I cannot now recall whence I obtained my specimen. It is absolutely hardy, and even 33° of frost last February left it entirely uninjured.

Q. densiflora (Hooker and Arnott), the Tan-bark Oak, is a handsome evergreen tree, which is becoming rare in its own habitat, California and Oregon, and is and has always been so here. Dr. HENRY states in 1910 that it was then "apparently unknown in cultivation in Europe except at Kew." My friend, Mr. F. R. S. BALFOUR, has, I know, grown it for some years in his beautiful grounds at Dawyck, co. Peebles, and indeed he reintroduced it into British cultivation from seeds gathered in the coast range north of the Bay of San Francisco. My plants, which I owe to his kindness, are still quite small, and have not yet got well hold of the ground nor



FIG. 15.—*QUERCUS ALBA*.

Quercus alba L.



FIG. 16.--*QUERCUS CASTANAEAFOLIA*.
Height 22 feet ; girth 3 feet from ground, 17 inches.



FIG. 17. *QUERCUS CONEARTA*.
Height 25 feet ; girth 3 feet from ground, 20 inches.

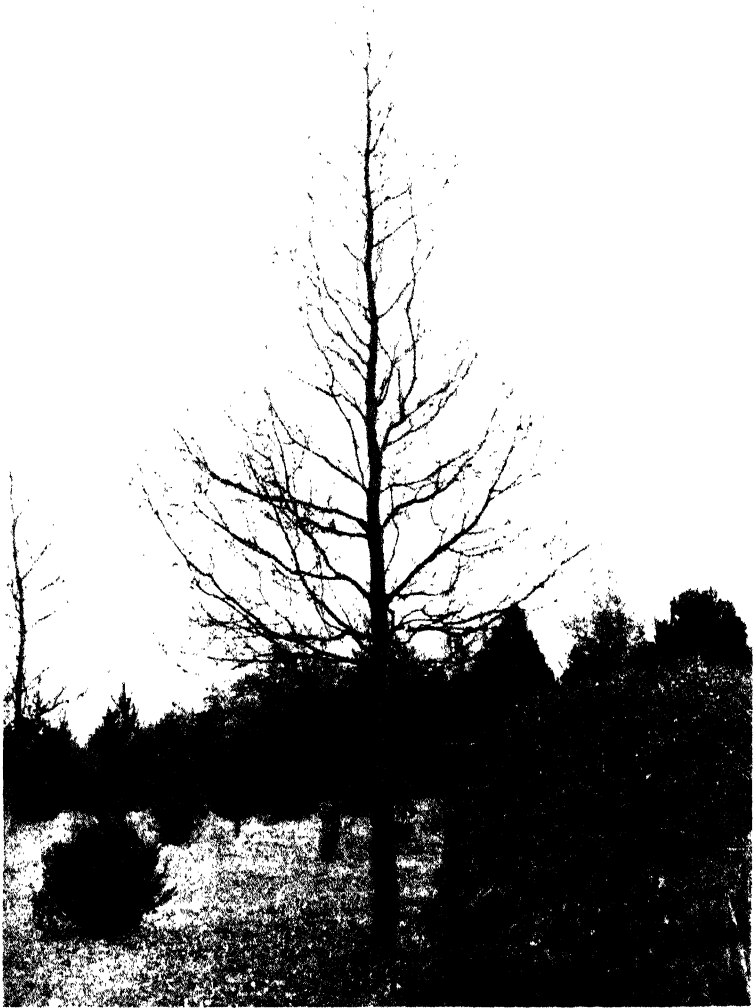


FIG. 18. *QUERCUS LANUGINOSA*.

Height 28 feet; girth 3 feet from ground, 25 inches.

(*Proc. Acad. Sci.* 1911.)

started into active growth, so that at present I can form no opinion as to their prospects. The biggest is but 3 ft. high, with a 2 ft. spread of branches, and seems inclined to be bushy. The tree when it does well is certainly worth growing and can be seen to advantage at Kew, where the best example must be about 25 ft. high.

In its own habitat it forms a symmetrical tree, and is reckoned as one of the most beautiful in California. The bark is rich in tannin, from which fact it derives its popular name; the wood, on the other hand, is economically worthless. The leathery leaves are from 2 to 5 in. long, being sometimes entire, at others coarsely serrate, and on the under-side densely downy. The oblong acorns, which are an inch or more long, are set in shallow cups and take two years to develop. Professor E. L. GREENE, of the California University, wrote of this species, in 1889, as "almost as much a chestnut as it is an oak," and its erect catkins are stated to be (for I have never seen them in life) more like those of a *Castanea* than a *Quercus*. In February of this year, when our glasses registered one degree below zero in the screen, its hardiness was severely tested, and, for a Californian plant, it came through the ordeal most satisfactorily; certainly many of the leaves were a little burnt, and the general aspect rendered rather shabby, but no serious injury was inflicted. I should not have expected a young plant, all in the frost level, which had not yet made vigorous root action, to get off so cheaply.

Q. dentata (Thunberg).—I have but one solitary specimen of this curious Japanese oak, now 11 ft. high, which grows very slowly in its present quarters, where neither soil nor climate are, I imagine, congenial. The leaves ought to be of enormous size, and any tree-lover who saw them for the first time, when properly developed, would be anxious to add a tree bearing such remarkable foliage to his collection.

My plant, however, is very disappointing in this respect, for, owing I suppose to want of vigour, it has never borne leaves at all exceptionally big, though I have had it a good many years. Mr. BEAN, in his "Trees and Shrubs," remarks that it "has never been really a success in this country," and, judging from the Aldenham representative, I can well believe him. It is apparently one of those exotics which drag out a sickly existence for a period of years without ever looking or feeling at home, or becoming truly naturalized, and finally disappear. It is getting on for a century since it was first introduced, and I doubt if there is a single fine specimen or one over thirty years old in existence. No tree however rare, or however beautiful in its natural habitat, gives me any pleasure to look on, whether in my own place or that of my friends, unless it be in good robust health. This dictum applies even more strongly to conifers than it does to broad-leaved trees. *Q. dentata* has never borne fruit with me, and, as I could not describe the acorns from personal knowledge, it is not worth while taking up time and space in copying the account of others.

Q. dilatata (Lindley).—My possession of this extremely rare

evergreen oak, from the Himalaya, is due to the generosity of Mr. J. E. GAMBLE, of East Liss, Hants, who is famous for having raised *Q. semecarpifolia*, another and more beautiful Himalayan oak which is hardly ever seen in Europe. *Q. dilatata* is found in moister localities and at a higher altitude than *Q. incana*, but at a lower level than *Q. semecarpifolia*. It makes a very large tall tree in its own habitat, is nearly evergreen, and has a dark-coloured bark, peeling off in longitudinal scales. The leaves are smooth, leathery, and shining, and vary from entire to serrate, the teeth being sharp and almost spiny; the blade is 2 to 4 in. long by $1\frac{1}{4}$ to 2 in. wide, the downy stalk is $\frac{1}{4}$ in. long; the acorns are mostly solitary, nearly stalkless, and half-enclosed in a cup $\frac{1}{2}$ in. wide. I cannot say when it was first introduced to Europe, but it was growing in the temperate house at Kew as early as 1882. It is not hardy, and I am not sanguine of being able to keep it long alive at Aldenham even in the most sheltered situation. *Q. incana* above mentioned, which comes from the same region, was killed stone dead with me in February 1919 by 33° of frost.

Q. ellipsoidalis (E. J. Hill).—Here again I have but two specimens, of which the biggest is 13 ft. high with a girth of 9 in. It is a true species, and extremely rare in cultivation—indeed, so rare is it that, I presume for that reason, it is entirely ignored both by ELWES and HENRY, and by BEAN; consequently I am left entirely to my own resources, and find it difficult in my ignorance to say very much about it. It is, I believe, related to *Q. coccinea* and *Q. palustris*, and anyone looking at it would be disposed to class it among the red oaks. Its habitat is, I am given to understand, Minnesota and the neighbourhood of Chicago, &c., in the U.S.A. The plant seems quite healthy, but does not grow with great rapidity. It is a well-looking tree enough, but it is not outwardly sufficiently striking or distinct to make its acquisition a matter of great moment to anyone but a botanic enthusiast who aims at a complete representation of the genus.

Q. × exacta (= *palustris* × *imbricaria*) (see pp. 177, 178).

Q. Fabri (Hance).—This deciduous oak was first discovered about 1869, in the province of Kiang-su, by C. FABRE-TONNERRE, a French doctor of medicine, after whom it is named, and not, as might be imagined, after the Rev. ERNST FABER, who collected at Mount Omi. Acorns have been recently collected by WILSON in China. The only place, so far as I know, where any account of it is to be found is in "Plantae Wilsonianae," vol. iii. pp. 216–7. I owe the possession of a specimen to the kindness of Professor SARGENT. It is 7 ft. high, comfortably established in its permanent situation, and gives every prospect of making a fine tree. Small as it still is, I doubt whether there are any bigger among the very few in cultivation in Europe. It is stated usually to form scrub or coppice growth in its own country, where large trees of it are rarely to be found.

Q. Gambelii (Nuttall), White or Shin Oak.—This small deciduous tree is found on the eastern slopes of the Rocky Mountains of Colorado and in Northern New Mexico, generally at a high altitude, 6,000 to

7,000 ft. It is named after Dr. WILLIAM GAMBEL, a naturalist who explored Upper California. It was first received at Kew in 1909, and the Aldenham specimen, which is now over 9 ft. high, was given me about the same date by Professor SARGENT, and as far as I know there are no older or materially larger plants at present existing in Europe.

The following account is abbreviated from SARGENT's "Manual of the Trees of North America." A tree with a narrow, round-topped head, usually about 25 ft. high, and rarely reaching 40 to 50 ft., leaves 3 to 5 in. long by 1 to 5 in. wide, broadly obovate to oblong lanceolate, rounded at the narrow apex, wedge-shaped, or sometimes narrowed and rounded, or broad, and heart-shaped at the base, lustrous and dark yellow-green above, and carrying a thick white felt on the under-side; the midrib being pale and prominent. Acorns oval, usually about $\frac{3}{4}$ in. long by $\frac{5}{8}$ in. wide, more or less deeply enclosed in the saucer-shaped, cup-shaped, or rarely turbinate, cup. These sessile acorns mature in one season. This species is the nearest of the Western oaks to the Eastern white oak, *Q. alba*, but the dead leaves do not cling to the branches in winter as do those of *Q. alba*. It is also very closely allied to the equally rare or rarer *Q. utahensis*; indeed, Professor SARGENT appears at one time to have regarded the two as synonymous; see, however, later in this article, *sub Q. utahensis*, the remarks of RYDBERG, who distinguishes between them, calling *utahensis* a small tree with leaves bearing a velvety surface on the under-side, and somewhat modifies SARGENT's account of *Q. Gambelii* by describing it as a bush in which this characteristic of leaves with a velvety under-surface is absent. Truth to say, very little is yet known about either of these two oaks on this side of the globe.

Q. Garryana (Hooker) is, like the last, one of the North American White oaks, which section as a rule thrives much worse in Europe than the Red; but, coming as it does from the West, it is likely to fare better than the Eastern ones. Its distribution ranges along the Pacific coast from Vancouver Island in the north to California in the south, and it is stated to be most abundant and attain the greatest size in Western Washington and Oregon. From 60 to 70 ft. seems to be its usual height, while sometimes reaching about 100 ft. The bark is of a light-grey colour; leaves obovate to oblong, pointed at the apex, wedge-shaped or rounded at base, coarsely lobed, dark green above, and light-green or orange-brown below, with a stout yellow midrib and conspicuous primary veins, in length 4 to 6 in. by 2 to 5 in. broad; acorns 1 to $1\frac{1}{4}$ in. long by $\frac{1}{2}$ to 1 in. broad. (See SARGENT's "Manual of the Trees of North America," p. 262, from which the above account is drawn, also "West American Oaks" by E. L. GREENE (1886), where it is stated that the sessile acorns are set in small shallow cups and mature in one year.) The general effect of the tree is not unlike that produced by our own common pedunculate oak.

The exact date of its first introduction into Europe is not known to me, but it was first received at Kew in 1805, though the plants of that date have not survived. By 1904 there was a plant in the Botanic

Garden at Darmstadt. We have about half a dozen small plants which have reached us from three or four different quarters, the tallest of these, 3 ft. 6 in. high, I owe to the kindness of Sir FREDERICK MOORE, of Glasnevin. This oak is slow growing in its early stages, and has not yet taken hold with me. Mr. F. R. S. BALFOUR collected acorns in the prairie lands south of Tacoma, Washington, and later on distributed plants to me and others. I should much doubt if there is as yet a plant 20 ft. high to be found anywhere in Europe. No account of this species appears in "Trees of Great Britain," presumably because in or about 1910, when that work was written, this oak could hardly be said to be in cultivation in Europe.

Q. Gilliana (Rehder et Wilson).—This is one of WILSON's recent introductions from China, and consequently does not appear in any botanical work with which I am acquainted, except "Plantae Wilsonianae," vol. iii. pp. 223-4. It is there described as a small tree or shrub with purple-brown twigs and leathery evergreen spiny leaves, oval or obovate in shape, having a yellowish or greyish-brown felt on the under-side. It is found in the form of scrub "in arid parts of the Tung River valley, and in those of its tributaries in Western Szechuan." It is such a new-comer that as yet it is impossible to predict what character it may assume under conditions quite unnatural to it in the strong clay of Aldenham. It is named after Captain W. J. GILL, who travelled in Western China in 1877, and frequently refers to the "holly-leaved oak" in his book, "The River of Golden Sand." My plant, which I owe to the kindness of Professor SARGENT, is 2 ft. 6 in. high.

Q. glabra (Thunberg).—I bought my plant some six years ago from Messrs. VEITCH, when, to the regret of all tree-lovers, they were winding-up their business. It is now, or rather was last year, a low, broad shrub 3 ft. high with a spread of 4 ft.; in good health, but giving no indication that it can ever be more than a large bush. BEAN writes of it as "better adapted for the milder parts of the country," but up to 1919 it did not suffer from frost, though it had had two very bad winters to contend with.

With its shining, oval, evergreen leaves it produces an effect somewhat similar to that of *Q. acuta*, but with that exception is quite distinct from any other oak with which I am acquainted. It is certainly not nearly so hardy as that species, and when we registered 33° of frost in February 1919, most of the wood was killed, and it was most seriously though not fatally injured, whereas *Q. acuta* in a similar and neighbouring site escaped scot-free. It was introduced into Europe during the first half of the nineteenth century, and is consequently fairly often to be seen in gardens. There is a fine specimen of this oak at Bicton, near Exeter, of which my friend Mr. BEAN gives me the measurements last April as being—height, 20 ft.; girth, 2 ft. 2 in.; diameter of branches, 20 ft.

Q. glandulifera (Blüme).—This Chinese or Japanese deciduous oak was introduced to England by Professor SARGENT in 1893. It

forms an elegant, graceful tree, and its long, narrow, oval, dark-green leaves, tapering at either end and about 4 in. long by $2\frac{1}{2}$ in. broad, are not unlike those of *Q. variabilis*, although the under-side is of a dull greyish-green, instead of having the beautiful silvery tone noticeable in that species. Professor HENRY records having identified a small *Q. glandulifera* when visiting Aldenham in 1908; this, which must have been given me, like other of my treasures, by my generous friend Professor SARGENT, should by now have been over 20 ft. high, but has, alas, succumbed, and my best specimen in 1918 is only 6 ft. in height, though not apparently wanting in vigour.

This is one of the trees of which WILSON collected seed on one or more of his botanical expeditions to China, and an account of it appears in "Plantae Wilsonianae," vol. iii. pp. 212-4. It is there stated to be very common in the Yangtze Valley, and to vary very much in the size and shape of the leaves, which are sometimes quite smooth and at others covered with silky down.

Q. glauca (Thunberg).—An evergreen oak which makes a big tree, and grows wild through Eastern Asia, in the Himalayas, Japan, China, and Formosa. It appears to have been first introduced from India about 100 years ago, but no plants of anything like this age are known to exist now in England. In the youngish state it is not, however, excessively rare in cultivation, and it is more through oversight than inability that I have so far been without one at Aldenham. I hope very shortly to repair this omission.

The leaves are leathery in texture, with very slightly serrated edges, and lanceolate in shape, about 3 in. long by 1 in. broad. No account is given of this oak in BEAN'S "Trees and Shrubs." Two large bushy specimens about fifty or sixty years old are to be seen at Tortworth. Their spread is about equal to their height, and they grow much in the same fashion as great Portugal laurels; even had they been severely pruned in youth, I don't think they would have ever made trees. Mr. BANTING, the gardener there, informs me that they have never suffered damage from frost.

Q. grossescrata (Blüme).—This is a deciduous oak hailing from Japan, which I saw growing in the Arnold Arboretum, when I was there in the spring of 1914, just before the outbreak of war. If I remember right, they were but little over twenty years old and yet were already fine striking trees with conspicuously large foliage. Many oaks, as I have said elsewhere in this article, grow much faster in the United States than they do in this country. As to my plants, it is true that I have them, but they are merely a row of little sticks in the nursery, about 1 ft. high, which were given me two or three years ago. So far though alive, and not, as far as I can judge, sickly, they have made little or no growth, and such leaves as they produced last summer were ill-developed and in no sense characteristic. BEAN speaks of the "splendid" foliage often seen on young plants, and states that he has measured leaves at Kew 12 in. by 7 in., but so far I can, I am sorry to say, record nothing of the kind on my plants.

I have noticed that many of these exotic oaks are very slow starters in our heavy soil. They will sometimes remain for several years almost dormant, making perhaps an inch of growth or even die back to near the ground level, and then suddenly make a start and quickly develop into vigorous young trees. In cases such as this of little oak seedlings with thin wiry stems, poorly developed foliage, and insufficient root, I am quite sure that the right course to adopt is the one advocated long ago by that sage counsellor LOUDON, namely, to cut them down level with the ground and make them begin over again; then, when in consequence they send up several new shoots, naturally all but the strongest and straightest one would be removed. By following this plan I am satisfied that a good specimen will be more rapidly obtained, and where the original stem is cankered or badly deformed, it is indeed the only way of getting a good plant at all. In case of commoner oaks I have frequently acted in this way with conspicuous success, but, where almost irreplaceable species are concerned, I admit that such drastic methods need both faith and courage, and it is easier to preach than to practise. *Q. grosseserrata* does not appear to have been in cultivation in Europe before 1903 when Professor SARGENT sent several plants to Kew.

In "Plantae Wilsonianae," vol. iii. pp. 231-2, there are notes about this tree, which was collected and observed by WILSON, who states that he is unable to distinguish it from *Q. crispula*. In that work it is treated as a variety of *Q. mongolica*, but in "Trees of Great Britain" Mr. ELWES deals with it, pp. 1327-8, as being a true species, and only mentions *Q. mongolica* incidentally in a note.

The three oaks are so close together that it is to my mind most unlikely that they will all continue to be regarded as separate species, but as is the case with the confusion surrounding the identity of, or difference between, *Q. Gambelii*, *Q. stellata*, and *Q. utahensis*, so with these three very little is yet known about them in this country. So keen an observer as Professor SARGENT admits that he cannot tell *Q. crispula* from *Q. grosseserrata* by the foliage, and as, even if they do bear acorns in this country, it may be fifty years before they are produced, most people will readily content themselves with one or the other. Besides my plants of *Q. grosseserrata* I have one of *Q. mongolica* but none of *Q. crispula*, though that is probably the least rare in Europe of the three. To my own knowledge it is to be seen at Kew, Edinburgh, and at Rostrevor, and doubtless in several other collections.

Q. × heterophylla (Michaux), Bartram's Oak.—This tree has been variously supposed to be a variety of *Q. Phellos* or *Q. nigra*, or a true and separate species, but has been conclusively proved to be a hybrid, of which one of the parents is certainly *Phellos* and the other generally *rubra*. The first tree of this kind to be found and described grew on the land of a man named JOHN BARTRAM, near Philadelphia, in the first half of the eighteenth century. He was a famous man in his time, and a botanical garden in that city now bears his name. Other

trees of the same appearance and similar parentage have been found in various parts of the United States, but according to Dr. HENRY, though in all these cases *Phellos* is one of the parents, the other is sometimes more likely to have been *coccinea* or *velutina* than *rubra*.

Kew has a specimen of this fine hybrid over 30 ft. high, which was sent there from the Arnold Arboretum in 1877. The Director has kindly undertaken to supply me with wood from it, which I hope to get successfully grafted on a *rubra* stock next March. The leaves, about 4 in. long by 1½ in. wide, are deciduous, lanceolate, with a sharp apex and wedge-shaped base. Sometimes they are entire, and sometimes they have "triangular bristle-pointed lobes, separated by wide sinuate sinuses."

Hybrids.—It may be well that I should devote a small portion of this paper to this subject, for the genus is certainly prone to hybridization, a habit of which I cannot altogether approve, either in my capacity of moralist or arboriculturist. Mr. ELWES, with whom I was in correspondence on some difficulties with which I had to contend in identifying some of my specimens, where the labels—as labels, alas, so often do—had disappeared, writes: "I am convinced that there are many hybrids both wild and cultivated in this genus." As an illustration of the truth of this statement, the famous Lucombe oak (*Cerris* × *Suber*) at once occurs to the mind. Seedlings of this hybrid display the most diverse forms, and it has also given birth to such striking varieties as *Q.* × *Lucombeana diversifolia* and *Q.* × *Lucombeana fulhamensis*.

Besides the Lucombe there is also *Q.* × *Leana* (*imbricaria* × *velutina*, or *coccinea*), *Q.* × *heterophylla* (*Phellos* × *rubra*), *Q.* × *ambigua* (*rubra* × *coccinea*), *Q.* × *Turneri* (*pedunculata* × *Ilex*), *Q.* × *audleyensis* (*Ilex* × *sessiliflora*?), and *Q.* × *Bebbiana* (= *alba* × *macrocarpa*) (see p. 161), *Q.* × *Sargentii* (*pedunculata* × *Prinus*). Besides these named and recognized hybrids there are growing at Aldenham—*bicolor* × *alba*, *Prinus* × *alba*, *Toza* × *lanuginosa*, *Toza* × *macrocarpa*, *Toza* × *pedunculata*, *rubra* × (?). Further, though they are now not to be found, our catalogue shows that we have had in the past *Q.* × *exacta* (*palustris* × *imbricaria*) and *Q.* *velutina* × *missouriensis*, whatever oak that last name may represent, of which I must confess my ignorance. Again, though I have no such specimen myself, crosses are known to exist between our two indigenous oaks, the sessile and pedunculate. Moreover, there is the well-established case of an oak at Tortworth, which is the result of the pollination of its *Toza* parent by a neighbouring pedunculate, and of which, as mentioned above, I have specimens. The well-known French botanist, L. TRABUT, in his book "Flore de l'Algérie," describes a natural hybrid, *Q.* *Mirbeckii* × *Ilex*, which he had seen in that country. The leaves resembled the former rather than the latter parent, as can be seen from fig. 14 on Plate 3 in the *Revue générale de Botanique*, vol. iv. (1892). This tree has, or had, the peculiarity that some of the acorn cups were sessile, and others pedunculate. In America

too, besides *Q. × Leana* above mentioned, where *Q. imbricaria* has been fertilized by *Q. velutina*, other hybrids of *imbricaria* are known to exist or to have existed, viz. *Q. imbricaria × marylandica*, *Q. imbricaria × palustris* (*Q. × exacta*), and *Q. imbricaria × rubra*. There is too a quite recent case of a man-made hybrid oak; according to the *Journal of Heredity*, October 1918, Mr. H. NESS, horticulturist to the Texas State Experiment Station, has crossed *Q. virginiana* with *Q. lyrata*, the latter supplying the pollen, and has been successful in producing a vigorous and fast-growing progeny, which in the density and lustre of its foliage is found to surpass either parent. The progeny is stated to resemble in habit the pyramidal form of the father rather than the broad, flat head and crooked limbs of the mother. The Bureau of Plant Immigration in Washington has been good enough to promise to try to obtain for me specimens of this hybrid, and of its parents, but even should success crown this kindly attempt, I much fear that *Q. virginiana*, at any rate, will prove too tender ever to flourish at Aldenham (see p. 221).

If I had to give a prize among hybrids, I think one produced by insect's agency and not by man's, namely, *Berberis × stenophylla* (*Darwinii × empetrifolia*) would receive my award, but that, as Mr. KIPLING used to say, "is another story."

In fine, there are many oaks beyond these which I have come across that cannot be depended upon to keep themselves to themselves, and, being what in Biblical language would be called "an adulterous generation," "go wrong" with strange species, and bring discredit on their order and confusion on botanical investigators.

Though I have never gone in for collecting hybrids as such, it will be seen from the above that I have accumulated a considerable number, and it may be that I have one or two more, for there are at Aldenham a few oaks of which the identity has not been conclusively determined, and I should not be surprised if they were ultimately to be pronounced to be hybrids of dubious parentage. I ought not to be drawn away from the subject of oaks, to which this article should be rigidly confined, but I cannot help dropping an *obiter dictum* in connexion with hybridization, which I have never seen expressed elsewhere. It is this: Is it not strange that whereas apple and thorn trees are not far separated botanically since both belong to the order *Rosaceae*, yet hardly anyone can point to a hybrid *Crataegus*, unless indeed *C. Carrieri* be one, whereas in the case of apples it is impossible to raise any *Pyrus* from seed with any sort of confidence that the seedling will be true to name; consequently all kinds of mongrels are put on the market and masquerade under specific names to which at the best they are only half entitled.

Q. Ilex (Linnaeus).—This oak is so well known and so often seen in English gardens that there is no need for me to spend time in describing it. The various specimens which I possess are in no way remarkable for their size or anything else, the tallest being barely 30 ft. high. This species seems to thrive better than might have been

expected on our cold heavy clay, but, as all planters are well aware, after it has passed the infant stage it resents removal more perhaps than any other plant which I know, except *Rhamnus Alaternus* and *Cupressus erecta viridis*. Of the half-dozen varieties which Mr. ELWES regards as sufficiently distinct to deserve mention, the most striking one growing at Aldenham is *Q. Ilex Gramuntia*, which is named after the Gramont estate, near Montpellier; though known for a century and described by LINNÆUS, it is very rarely to be seen in England. My plant was given me some fifteen years ago by Lord DUCIE when a little bit of a thing, it is now a neat and well-shaped pyramid 12 ft. high and 6 ft. in diameter. It has the same habit as is often seen in the type, that is to say, it has a central stem and a fine tapering leader, whilst a multitude of fine twig-like branches set very close together and of even size and growth give it a holly-like aspect. The small, evergreen, roundish, crinkly, spiny leaves are very different from those of an ordinary holm oak, and give the tree a distinction which makes it worth growing by the majority for whom ornamental appearance is the one and only consideration. So far it has proved perfectly hardy, being entirely unaffected by the bitterly cold east winds of 1916-17, or even by the temperature falling to one degree below zero in February of 1919; the same remark applies both to the type and to other varieties, but ELWES mentions its having been killed in the winter of 1853-54 at Rolleston and Oulton. Having escaped all damage from frost, unluckily my best plant fell a victim to the heavy snowstorm on April 27, 1919, and was much damaged thereby.

Another attractive *Ilex* variant, of which we possess two healthy well-grown examples over 5 ft. high, is *Q. Ilex Fordii*. This has glossy narrow little leaves, about $1\frac{1}{2}$ in. long by $\frac{1}{2}$ in. wide, with a long sharply pointed apex, and toothed and wavy margins.

I have also another variety called *Q. Ilex laurifolia*, which has long narrow lanceolate leaves and shows good prospect of making a very ornamental tree. It is a rather bushy pyramid over 7 ft. high and over 5 ft. across at the thickest, with a slender central stem and leader. I bought my plant about six years ago, when VEITCH'S famous nursery was, alas, coming to an end. It was sold to me as *Q. laurifolia*, and I, being quite ignorant of the appearance of the true species originating in Florida and Virginia, to which that name belongs, was landed in the fool's paradise, in which so many young collectors disport themselves, and boasted of the possession of a very rare American oak, until someone whose knowledge was beyond question pointed out to me that it was nothing more than a form of the common *Q. Ilex*. I must say in my own defence that long before this sad discovery I had frequently remarked to my gardener, BECKETT, that if I hadn't known that *Q. laurifolia* was a good species I should have put it down as a variety of *Q. Ilex*! The true *laurifolia* does in fact bear no resemblance to an *Ilex*, but is deciduous, and nearly related to *Q. imbricaria*.

Of course it seems very stupid to have blundered in this fashion, but the root of the evil is reckless nomenclature by the nurserymen. To begin with, it is a fatal error to send a plant out under a varietal name, suppressing altogether the specific one; next, it should never have been given a varietal name which had already been allotted as a specific one to a totally distinct oak. In this case *Q. Ilex lancifolia*, or *lanceolata*, would have been a suitable name and free from any objection.

It would mark a great step in advance if nurserymen could be persuaded before giving varietal names to plants which they have raised and which appear to differ from the type, to submit the proposed epithet to Kew, and learn if there is anything to be said against it. Only the other day, in response to an inquiry of mine as to what oaks they had in stock, one leading member of the English trade informed me that he had among others *Q. magnifica*, and another that he had *Q. longifolia*—"fool names," as Mr. ELWES would call them, which give no clue to the species. Probably *Q. Ilex* varies in leaf as much or more than any other of the genus. It has this resemblance to the true holly, after which it is named, that the leaves have sometimes sharply spiny, and sometimes quite smooth, wavy, edges, but so far I have never noticed in the case of the oak, what is often to be seen on hollies, both forms on the same plant. I have examined samples of some twenty *Q. Ilex* raised by my friend Mr. VICTOR AMES from acorns collected near Florence. Nearly all of these had pronounced thorny edges, but one had a mass of tiny, crumpled, spineless leaves set very closely together, which approach nearly, although they are not quite so eccentric in form as, the named variety described in the books as *Q. Ilex crispa*; another, of which he sent me samples, had very long, narrow, spineless leaves, almost in shape like those of *Q. incana*.

At Aldenham all the *Q. Ilex* which I have had for any time have smooth spineless leaves. I have, however, two small plants, kindly given me by Mr. GERALD LODER, which answer so nearly to the account in BEAN'S "Trees and Shrubs," vol. ii. p. 313, of *Q. Ilex latifolia* that I feel entitled to give them that name provisionally, though as they are still quite young I feel no assurance that the large size and toothed or serrated edges of the leaves are not mere juvenile forms, which may disappear as the trees become more mature.

Q. ilicifolia (Wangenheim), the Bear Oak.—I have had for the last ten years or so plants of this dwarf or scrub oak growing at Aldenham; they seem quite healthy but make very slow progress, and the biggest of them is only 4 ft. 6 in. high: even in their natural habitat, the Eastern United States, I believe they grow but slowly, and seldom attain much more than 20 ft. The name given to this species by American botanists of *Q. nana* seems to me vastly more appropriate than the one adopted, on the ground of seniority, by Kew, which heads this account. I am at a loss to see any resemblance in the deciduous leaves of this tree to those of a holly, such as really

does exist to a certain extent in the case of the shiny evergreen foliage of *Q. coccifera*, *Q. agrifolia*, and of *Q. Ilex Gramuntia*.

To my mind the general appearance of this species much more suggests a stunted form of *Q. coccinea*, and the likeness is all the stronger in autumn, when the dying leaves turn a good red, although according to BEAN'S book this satisfactory feature though usual in America is rarely manifested in England. It is not often seen in cultivation here, and I find no special reason to think it likely that it ever will be. There is, however, a good-sized brake of it at the bottom of the Tortworth Arboretum, which when in fruit makes attractive game covert. The plants must be thirty or forty years old. The soil natural to it is dry and sandy, but it seems quite at home in the very different conditions prevailing in Gloucestershire and Herts.

No varieties of this oak are given in the books, but the tree is known occasionally to depart from its customary stunted habit, and there is a specimen at Aldenham labelled *Q. ilicifolia arborescens* which grows normally, having nothing of the dwarf about it. I bought it at Muskau in 1902, and it is now over 16 ft. high. In my experience they were very careful in that nursery to have their stock true to name, and no one who has not engaged on this task can realize how difficult it is of perfect accomplishment on a large scale. Careful comparison with undoubted examples of the type reveals no difference except in growth, and none of the learned botanists who have honoured my arboretum with a visit has as yet thrown any doubt on the nomenclature. I have not been able to learn of any other specimen of an arborescent form of *Q. ilicifolia* elsewhere in this country.

Q. imbricaria (Michaux), Shingle Oak. -- This handsome deciduous tree, which reaches 100 ft. in height in its home, the Central United States, has long entire leaves, and, partly for that reason I suppose, was classed by LINNÆUS as a variety of *Q. Phellos*.

It was introduced to England as early as 1786, but has always been very rare here, and is far less often seen than *Q. Phellos*. I have but one specimen, which Mr. ELWES mentions in his book as having been identified by him when staying at Aldenham in 1908. This would now, ten years later, have been quite a fine young tree, but unluckily, and curiously enough sharing its misfortune with my best specimen of *Q. Phellos*, it was terribly smashed about in a gale and lost about 5 ft. of the head. With the object of starting a new leader I have had to cut all the boughs back very severely, so for the time the tree is quite disfigured, but where roots and stem are healthy no one need despair of the head when broad-leaved trees are concerned.

Q. incana (Roxburgh). -- This handsome evergreen oak grows more or less gregariously on dry hillsides in the North-West Himalaya in company with *Rhododendron arboreum*, and has a rather stout short trunk with spreading branches, totally different from the erect, thin-stemmed tree as grown in the Temperate House at Kew. It is found at a lower altitude than *Q. dilatata*, which in its turn gives place, as

one rises higher, to the handsome *Q. semecarpifolia*, a quite cold-climate tree. The leaves of *Q. incana* are from 3 to 4 in. long by about 1 in. or less across when cultivated in Europe, but in a wild state they are not nearly so narrow. In colour they are dark green on the upper side, about the same shade as in *Q. Ilex*, and on the under side they are of a silvery grey. My friend Mr. GAMBLE, whose trees of *Q. semecarpifolia* are so well known at his Hampshire home in East Liss, has been by no means equally successful with *Q. incana*, nor has Kew fared any better with it in the open. My report on the Aldenham specimen is not much more favourable. I have had it about four years, and it has never had any protection other than that afforded by adjoining shrubs, and showed no signs of having suffered seriously from frost damage when its hardiness was severely tested in 1916-17, but in February 1919, when our glass registered 1° below zero—that is, 14° lower than the lowest recorded in London, only twelve miles away—it was entirely crippled if not killed. Our plant was of bushy growth and 2 ft. 6 in. high. Another plant, somewhat smaller, was kindly sent me last year by the Director of Kew. Owing presumably to its rarity, this oak is not mentioned by BEAN at all, and there is only quite a short account of it in the work of ELWES and HENRY, which does not disclose the date of its introduction into Europe, but I do not suppose this can have been long anterior to 1910.

Q. infectoria, see sub *Q. lusitanica*.

Q. insignis (Martins), Mexican White Oak.—I recently received a small specimen of this oak from the Bureau of Plant Immigration in Washington, an institution which has been doing admirable work in the U.S.A. for the last six or seven years, and with which I have on various occasions exchanged plants. I can find no account of this deciduous oak in the works of ELWES and HENRY or of BEAN, but as it comes from Mexico one would not *primâ facie* expect it to prove hardy, though it would be premature for me to express an opinion on the point. *Choysia ternata* affords proof that Mexican origin is not necessarily a bar to a plant being able to weather English winters, and, for the matter of that, *Q. obtusata* teaches the same lesson.

I do not know of any other place where it is in cultivation in Europe. The account of it which appears in the sixth annual list of New Plant Introductions, Washington, is as follows :—

“ A rapid-growing tree, very different in habit from most oaks. Is quite erect, reaches a height of 75 ft. and sends out large branches 30 or 40 ft. above the ground. It is best suited to a warm moist climate. Acorns of most unusual size.”

This passage is not couched in technical language, but in intelligibility it compares very favourably, say, with the description given of *Q. mongolica* in “ *Plantae Wilsonianae*,” vol. iii. pp. 230-1, from which I defy anyone to form the faintest impression of any characteristics of that tree except its bark.

Q. Kelloggii (Newberry), Californian Black Oak.—This takes its popular name from the colour of the bark. I have been slow in

securing a specimen of this handsome tree which in its foliage reminds one of the red oaks of the Eastern States. I have only a small nursery plant some 2 ft. high, which was given me by Mr. F. R. S. BALFOUR, and was raised from seed which he gathered in California. He writes to me picturesquely of his remembering them "forming a grove on the 'floor' of the King's River Cañon there, where among *Libocedrus decurrens* and *Pinus ponderosa* their trunks rose tall and straight out of a wild garden of evening primroses." He adds that he thinks this tree more likely to flourish in our climate than any other Western oak. I have, however, often had the opportunity of admiring the fine examples at Tortworth, probably almost the only private grounds in Europe where developed members of this species are to be seen. These two fine well-grown specimens are now over forty years old, and over 30 ft. high, and are still growing strong, and in the rich soil in which they are planted there seems no reason why they should not some day double their present height. The tree was first discovered in 1846, but outside its own habitat it has never been other than very rare. Though a handsome deciduous oak, its general superficial aspect is not sufficiently different from the far commoner but at least equally beautiful *Q. rubra* to make it important that anyone who is not a collector should possess them both. Though so like the Eastern *Q. rubra* in leaf, the acorns, which require two seasons to reach maturity, are markedly different. It is also true that the bright shining appearance of the leaves gives it a superiority over the comparatively dull ones of *Q. rubra*.

Q. lacera (Blüme).—This is an interesting Japanese oak which has, I believe, never been grown in England, but seems well worthy of introduction. Kew imported two plants some few years ago, but they did not survive the journey. It is possibly allied to, or even a variety of, *Q. glauca*, but the foliage appears to lack the silky appressed hairs which are characteristic of that species. I have never seen more than a dry leaf of *Q. lacera*, but that was noticeably different from any other oak which I know. It was $5\frac{1}{2}$ in. long by $1\frac{1}{2}$ in. at the widest, and had nine lateral nerves on each side of the midrib; along the edge were short, sharp, spiny lobes, and the apex was very long, very narrow, and spike-like. The specific name means "torn" or "lacerated," and probably in the leaf which I have endeavoured to describe the laceration was less pronounced than usual.

Q. laevigata (Blüme).—Little is known of this hardy and handsome Japanese species; it does not appear to be figured in any publication, and there is no specimen to be seen at Kew. The plant in the Royal Botanic Gardens, Edinburgh, was obtained in April 1908 from the Yokohama Nursery Company, in whose (1907) catalogue it is described as a large-leaved, large acorn-bearing, fine forest tree. It is now about 4 ft. high; and my specimen, which I owe to the generosity of Professor BAYLEY BALFOUR, is about the same height, and thriving well. The Professor has favoured me with a translation of the account of this oak as given by BLÜME in "Museum

botanicum Lugduno-Batavum," vol. i. (1850), p. 304, and I will here transcribe it: "Branchlets glabrous, leaves oblong-lanceolate, 5-7 in. long, $1\frac{1}{2}$ -2 in. broad; petiole $\frac{1}{2}$ -1 in. long; blade long, acuminate, narrowed at the base into petiole, entire or at the apex sub-crenulate, coriaceous, glabrous, the veins on each side 11-12 in number, sub-parallel, prominent on the under side, and joined together by a faint sub-arcuate reticulation. It is the *Ookasi* of the Japanese. It is akin to *Quercus marginata* and *Q. glabra*." It is classed by BLÜME among dubious and little-known species, and is entirely evergreen. Professor BAYLEY BALFOUR writes: "Its affinity is probably with *Quercus acuta* (Thunberg). In Matsumura's 'Index Plantarum Japonicarum,' p. 25, it is treated as a synonym of *Q. acuta*, along with *Q. Buergeri* and *Q. marginata*. Obviously some of the Japanese botanists are inclined to sink the species in *Q. acuta*, but their nurserymen keep it distinct." After carefully comparing my plants, I agree that *Q. laevigata* is very like *Q. acuta*, but they are certainly not the same. The nerves in the leaves of the former are more numerous, and the striking feature of the long narrow bases of the leaves, tapering so finely into the stalk that it is impossible to say where leaf ends and stalk begins, is only noticeable in the former. The general appearance of the two trees is also distinct. The leaves of both the Edinburgh and Aldenham *Q. laevigata* are absolutely entire.

Q. lanuginosa (Lamarck).—I have several examples of this attractive deciduous denizen of Southern Europe. The oldest is now a well-grown tree 28 ft. in height, while I have others, all progressing satisfactorily, 26 ft., 18 ft., 15 ft., 10 ft. high. Mr. BEAN states that this oak only makes "a medium-sized or small tree," but from the short time which my plants have taken to reach their present respectable height, I should have fully expected it to make quite a tall tree; evidently it finds itself quite at home in our heavy clay, which is the more curious, as in its own habitat it is stated by Mr. ELWES to affect "dry soils, especially those of limestone formation." In the case of my three biggest trees, the leaves are smaller and more crumpled than is found in the type, and they ought probably to have a varietal name, such as *Q. lanuginosa crispa*. They have, too, the peculiarity that the leaves, instead of tapering into the stalk in the ordinary way, have two neat little semicircular curves at the base. I venture to think that one of them (fig. 18), a young tree standing in the open, is as nearly perfect as possible both in respect of pruning and growth, but this is vanity, so I will cease from blowing my own trumpet.

We have also a tree bigger than any of the above, being 33 ft. high, which came to me as, and has for many years been called, *lanuginosa*, or one of its synonyms. This year, however, a committee of experts have pronounced it to be either an exceptional form of *Toza*, or a hybrid, that is to say, *Toza* $\times$ *lanuginosa*. I incline to the latter view, as it is so unlike any *Toza* known to me, and it will be dealt with later in this paper under that heading.

Anyone who like myself has been closely studying and constantly referring to vol. v. of "Trees and Shrubs of Great Britain," in which appear the accounts of exotic oaks, might be excused if he came to the conclusion that by some unaccountable oversight all mention of *Q. lanuginosa*, other than an incidental sentence, had been omitted. The fact is that, owing to what I must reluctantly regard as the bad arrangement of that otherwise splendid work, this tree does not appear with the other exotic oaks, including its close ally *Q. lusitanica*, but is dealt with in vol. ii. pp. 294-5, and follows the accounts of the two indigenous members of the genus, viz. *Q. pedunculata* and *Q. sessiliflora*, the three species being those into which the *Q. Robur* of LINNÆUS has been divided. I cannot help feeling that in a work of this scale all the oaks should have been brought into one volume, and, instead of following one another higgledy-piggledy, should have been set out on some system. Even so perfunctory a classification as the separation of deciduous and evergreen would have been better than nothing at all. Neither in this work nor in that of Mr. BEAN is there any record, even approximate, of the first introduction of this tree into Great Britain, but I presume it must have been a long time ago, for it is by no means one of the rarest of foreign oaks in this country, though Mr. ELWES states that "it is usually small and stunted," and, true as this may be generally speaking, I am very glad to know that the Aldenham plants are an exception. Mr. ELWES records three varieties—*Dalechampii*, *dissecta*, and *Hartwissiana*, none of which I am lucky enough to own, though my catalogue shows that I had at one time, but have lost, the second of the three. Unfortunately this species has often been sent out by nurserymen under the name *Q. mongolica*, a Chinese tree, of which I possess one small example. I myself bought many years ago an oak under this name, and it was quite a long time before I detected that it was nothing more than *Q. lanuginosa*; therefore anyone who has a plant purporting to be *Q. mongolica* is, as the lawyers say, "put on enquiry," and should satisfy himself that he has not been entertaining *Q. lanuginosa* unawares, for the true *mongolica*, which is closely allied to *Q. grosseserrata*, is most rare in European cultivation.

Q. laurifolia (Michaux).—I have no better claim to include this among Aldenham oaks than that I have made strenuous though quite ineffectual efforts to obtain it. The first plant, which I bought from a most famous English nursery, proved to be nothing more than a lanceolate-leaved variety of *Q. Ilex*! My second attempt also in a very well-known quarter resulted in the acquisition of a specimen of the American Water Oak, *Q. nigra* (syn. *aquatica*). However, my friend Sir JOHN ROSS, more fortunate than myself, has got a genuine example of this rare oak from the Southern States of America, and one too with exceptionally fine foliage. He has sent wood to another good friend of mine, Professor BAYLEY BALFOUR of Edinburgh, who is engaged in trying to strike cuttings for me. In such a task he is unlikely to fail, for he and his merry men have the uncanny arts of a

wizard in performing what used to be regarded as impossible in this respect. Whether he does succeed or not, I took steps last spring to arrange for the grafting in the next of this and other rare oaks, at present missing from our arboretum, on appropriate stocks.

In spite of my inability to describe an Aldenham plant, here is some account of the foliage and distribution of the one to be seen at Rostrevor:

Leaves of a light green colour, linear lanceolate to oblanceolate in shape, 4 to 5 in. long by about 1 in. wide, usually marked by a little rounded lobe only on one side of the blade, and about three-quarters of the way towards the apex. This quaint and unequal lobing seems only characteristic of young plants, and tends to disappear altogether when the acorn-bearing stage has been reached. *Q. laurifolia* is a close ally of *Q. nigra*, and both alike bear in the United States the popular name of Water Oak; the former has the more Southern distribution, which extends from Virginia to Florida. Though not tender to the extent and degree of some of the Mexican and Himalayan oaks, it is not so hardy as *Q. nigra*, and should do better in Cornwall or the Mourne Mountains than north of London.

Q. × Leana (Nuttall), Lea's Oak.—This is a fine hybrid, *Q. imbricaria × velutina*, of which there appear to be several isolated examples in various parts of the United States of America. It was first discovered by Mr. T. G. LEA about 1830, near Cincinnati. The leaf as figured by Mr. ELWES is long and narrow, irregularly and shallowly lobed, with tapering pointed apex and rounded base.

The only mature specimens of which I have heard in England are at Kew and at Ham Manor, Sussex, and, as they are not identical in the form of their foliage, I hope to get them both grafted for Aldenham next spring. They are both stately, handsome trees over 60 ft. high. I have a well-grown, healthy young tree 14 ft. high, which came to me some years back as *Q. alba*, but which has a marked bristle, or mucro as botanists name this feature, at the points of the lobes of the leaves, a feature quite absent from the true *alba*. This has been pronounced by two such good judges as Mr. W. J. BEAN and Mr. A. BRUCE JACKSON to be *Q. × Leana*, and I cannot dispute their verdict. As a general rule when I am uneasy as to a plant being correctly named, I find no difficulty in getting expert friends to agree that the name is wrong, but, when it comes to the business of giving a new one, unanimity is much less easy to secure. I have also recently acquired two small plants from Messrs. VEITCH of Exeter.

Q. Libani (Olivier).—We have three or four specimens of this graceful, elegant, deciduous oak; the biggest is now 24 ft. high, with a girth 3 ft. above ground of 1 ft. 8 in. It would have been materially taller, but it was growing so rapidly that the leader became dangerously long, slender, and whippy, consequently we were compelled a few years ago to shorten it considerably; it has now made a fresh lead and is going on very well. Dr. HENRY, writing in "Trees of Great Britain" in 1900, mentions it as "a healthy young tree which produced ripe



FIG. 10. QUERCUS X LOCOMBEANA.

[*Ex. fac.* p. 186.



FIG. 20. *QUERCUS PEDUNCULATA*.
Height 65 feet : girth 3 feet from ground, 11 feet 6 inches.



FIG. 21. - OAK STEMS IN OLD WOOD.



FIG. 22. - QUERCUS PEDUNCULATA.
Young trees.

{To face p. 187.

fruit in 1908." It has borne what appeared to be fully developed acorns in several seasons, but so far they have never germinated when sown. These acorns are of a dark chocolate colour, and, with their neat finely scaled cups, into which they are very deeply set, give a pretty effect. BEAN mentions that it is allied to *Q. macedonica*, and indeed the long narrow shape of the slightly indented leaves is similar in both, though *Libani* is much the lighter of the two in colour. Although Dr. HENRY calls it "A small tree or large shrub . . . extremely rare in England," there is nothing of the shrub about my plant, which has every appearance of being likely to make a big shapely tree and that before many years are past. I cannot now recall the *provenance* of my plants, which I am glad to say are all thriving and quite hardy.

Q. lobata (Née).—Valley Oak is a very fine, shapely, deciduous tree in California, often 100 ft. in height, but is said to grow very slowly in this country, into which it was first introduced about 1870.

The bark is darkish grey in colour; the obovate leaves have many long narrow lobes, and are not specially impressive either in size or shape. The very long, slender, conical, subsessile acorns are set in deep hemispherical cups, and develop in one season; they are said to be edible, and to have been largely used as food by the Indians: the timber is poor and brittle, and only good for firewood. The tree is common enough in California, but is not found growing wild outside the limits of that State. It is nearly allied to another Western white oak, *Q. Garryana*, but can easily be distinguished from it by the presence of long, drooping, sterile branchlets, which give this species a weeping willow-like aspect when it approaches maturity. It has also affinity with the Eastern white oaks.

In 1864 the well-known French botanist, ALPHONSE DE CANDOLLE, was inclined to regard the leading Pacific white oaks, *lobata*, *Douglasii*, and *Garryana*, as mere forms of *Q. Robur*, and though I don't suppose that such a doctrine would now find many adherents, yet it seems clear that these Pacific oaks have a much closer relation to their European congeners than to those found east of the Rockies, and along these lines may be found the true reason why the flora of the West are generally found to thrive so much better in Europe than those of the Eastern States. The Kew specimen is over 30 ft. high, and that of my friend Lord DUCIE exceeds 20 ft., while mine, "*proximus longo tamen intervallo*," has only reached 3 ft. 3 in., though apparently in robust health. I have no record of the quarter from which I obtained my plant, but my impression is that it came from Messrs. BARBIER of Orleans, who in the pre-war days used to have a large and varied stock. My friend F. R. S. BALFOUR, who has often observed this species in its own habitat, considers it to be more like our *Q. pedunculata* in general appearance than any other Western oak.

Q. × Lucombeana (Sweet) (fig. 19).—This handsome and well-known hybrid between *Q. Cerris* and *Q. Suber* originated from the accidental

pollination by wind of the former by the latter in the Exeter nursery of a gardener named LUCOMBE between 150 and 160 years ago. The original Lucombe oak still stands, and at the time of Mr. LUCOMBE's death it had already grown big enough to enable the boards of his coffin to be cut from one of its branches.

It is too familiar with tree-lovers to need any prolonged description here. Like most hybrids Lucombe seedlings vary greatly in respect of the extent to which they approach one or other of their parents. Among other points of difference some are deciduous and others in mild winters quite evergreen; those plants which I have seen in fruit all bore very small acorns. This tree is not extensively represented in the "Hortus Aldenhamensis," but I have three specimens which luckily illustrate almost the extreme of difference possible in Lucombe; indeed, they diverge to such an extent that one has constantly to remind oneself of the hybrid origin in order to retain the belief that they have one parentage. The eldest is a fine free-growing shapely pyramid with clean straight stem 29 ft. high, with a girth of 2 ft. 3 in. at 3 ft. above the ground. Except that the leaves average about 3 in. in length instead of 2 in., they are in other respects just those of a typical *Suber*, having the dark glossy green surface and smooth grey felty under side characteristic of that species; moreover, they are practically persistent. Only in the look of the stem is there any trace of *Cerris* pedigree. The two younger plants, on the other hand, show very much of the Turk, and do not yet disclose to the non-botanic eye any corky origin: the leaves are small and rather crumpled, and remind one of the variety of *Q. Cerris* known as *crispa*. These two specimens are 8 and 10 ft. high respectively. It is fortunate that however much these seedlings of Lucombe may differ in outward looks, they one and all, as far as I know, inherit the cold-resisting properties of their *Cerris* mother instead of the tenderness of their *Suber* father. A fine specimen of the Lucombe oak is growing at Ottery St. Mary, near Exeter, in the grounds of my friend Lord COLERIDGE; it measures 69 ft. in height, with a girth of 4 ft. from the ground of 10 ft. 5 in. It reproduces all the characteristics of Lucombe's original hybrid a few miles away, and is no doubt one of its offspring.

Of the four or five recognized and named varieties of the Lucombe oak, I can only boast of possessing two, viz. *diversifolia* and *fulhamensis*. The former is a neat, shapely little plant some 5 ft. high, of which fine specimens are to be seen at Kew, which exactly correspond with ours in foliage. This variety of the Lucombe hybrid presents one of the quaintest and most striking instances of leaf variation with which I am acquainted. It is so well described by Mr. BEAN that I venture to quote from his account verbatim: "Leaves of extraordinary shapes; usually the middle part of the blade is reduced to a narrow strip about $\frac{1}{8}$ in. wide each side the midrib, widening at the apex like the bowl of a spoon, sometimes entire, sometimes three or five lobed: the base with from one to five shallow or deep, rounded, or pointed lobes. The leading types of leaves may be described as fiddle-shaped and spoon-shaped. Bark corky; habit very erect;

evergreen. A small tree." This clear and graphic picture calls up a vision of a tree as far removed as can well be possible from either of the two oaks *Cerris* and *Suber* which went to its making. My own plant shows no sign of having been grafted, and I have no idea how and where it was raised. Outside ours and the Kew specimens, I have myself seen it nowhere else.

Q. × Lucombeana fulhamensis.—This is perhaps the most charming of the many and diverse forms of this hybrid. It owes its varietal name to a famous tree which stood for many years in OSBORNE'S nursery at Fulham, but which was cut down, and the land devoted to building, about 1890.

It is a great pity that this particular tree was not preserved, as could easily have been done by grafting, for the trees bearing that name which now (1919) exist at Kew differ materially from it in foliage, and are to my taste inferior, though, as I have already said, their habit is particularly graceful, owing to the terminal part of the boughs being pendulous. I have seen dried specimens of the leaves of OSBORNE'S old tree, and they are about 3 in. long by nearly 2 in. broad, and gradually and regularly lessen in width from base to apex; they have a scrolled edge with little, flat, shallow rounded lobes uniform in size, and the base itself is full and rounded: on the other hand, the leaves of the existing trees at Kew have much deeper, more pointed, and more irregular lobes, and though the leaves are about the same length they are narrower, and are more or less of the same width from base to apex, while the base itself, instead of being broad and gently rounded, slopes off to a sharp point where it joins the stalk. At Ottery St. Mary, above mentioned, there are two fine trees of this variety, 45 and 39 ft. high respectively, of which the stems are markedly corky. It would seem that this pretty variety has almost gone out of commerce in England. I suppose even ten years ago it would have been easy enough for me to obtain an example from a nurseryman, but I neglected to do so, and last year I tried for long in vain to get one from the trade, but have lately secured a well-grown plant 10 ft. high, as also a cut-leaved sport from this variety 2 ft. 6 in. high, called *f. laciniata*. I also hope to have wood from the Kew tree grafted next March on an *Ilex* or *Cerris* stock.

In the case of grafting it is obviously better to have the stock and scion as closely allied as possible, and I should say that *Q. rubra* would be the best stock for any American oak not easily obtainable on its own roots, *Q. Ilex* for any evergreen oaks, *Q. Cerris* for any variety of Lucombe, and *Q. pedunculata* for any others.

The habit in English nurseries, so far as oak-grafting has of late years been practised at all, has been, I understand, to employ *Q. pedunculata* in all cases, although older examples of *Q. × Lucombeana* are found to be grafted on *Q. Cerris*. I am quite convinced that saddle or cleft grafting makes a better union than side grafting and should always be adopted, at any rate for oaks. I think it highly probable that some of the more delicate exotic oaks would do better in England when grafted on vigorous appropriate stocks than on their own

roots. Grafting, I may mention here, is not a thing like matrimony which can be entered on "lightly and unadvisedly," for the stocks have to be prepared twelve months beforehand, and, to secure a reasonable prospect of success, the work must be done under glass and not in the open.

I have besides the above a variety of Lucombe which has no counterpart at Kew either in life or in the herbarium, nor, as far as I can ascertain, anywhere else, and to which accordingly I have for purposes of identification given my own Christian name, *Q. × Lucombeana Vicarii*. This is a shapely, well-grown tree, over 17 ft. high and having a girth of 1 ft. 4 in. at 3 ft. above ground. In growth, wood, buds, and general appearance there is nothing at first sight to differentiate it from a small-leaved variety of the Turkey Oak, but expert investigation shows the under side of the leaves to be too downy for it to be possible for the tree to be pure *Cerris*, and it has been definitely pronounced to be an unusual form of Lucombe. The little thin oval leaves with tapering apex are practically uniform in size all over the tree, that size being about $1\frac{1}{2}$ in. long by $\frac{3}{4}$ in. broad; they are fringed with fourteen neat little teeth or lobes, contrasting in that respect markedly with the coarse dentation of an ordinary *Cerris* leaf. In mild winters this oak is evergreen, though that phenomenon may not be preserved when the tree reaches the fruiting stage. In spite of the fact that one night in February, 1919, our glasses registered 1° below zero (a cruel dispensation, provided exclusively, I think, to scourge Aldenham), the leaves though brown and dry were still adhering to the branches in March of this year.

Q. lusitanica (Lamarck), Portuguese Oak.—This medium-sized deciduous tree was introduced into England in 1835, but is still extremely rare, and in 1910 Mr. ELWES writes in "Trees of Great Britain" that the only plants which he had seen were at Kew. Till quite recently I should have said that we had seven or eight healthy specimens 8 to 10 ft. high, but unfortunately these, when submitted to the Kew experts, have been pronounced to be merely a variety of our pedunculate oak with very neat regular lobing, so that I now find myself with but one true plant of this oak which I acquired in 1914, and which is but a little thing and not too healthy.

As its name implies, its habitat is the Iberian peninsula. The leathery leaves are about $2\frac{1}{2}$ in. long by $1\frac{1}{4}$ in. wide, and are coarsely toothed on the edges; in colouring they are of a dull grey green, being covered on the under side with a dense greyish felt, as is also the case with the twigs or branchlets.

Outside Kew it seems doubtful if there are any trees over 20 ft. high now living in the British Isles. This seems to be one of the most variable of oaks, though only three varieties are recorded in "Trees of Great Britain," namely, *Broteri*, *faginea*, and *alpestris*, which I have never possessed,* but I have many young plants about 6 or

* As to forms of *Mirbeckii* which correspond to these three varieties, see later sub *Q. Mirbeckii*.

7 ft. high which are seedlings of a grafted oak at Tortworth, there called *Q. serratifolia*, but which is now regarded as a variety of *Q. lusitanica*, and very near to, if not the same as, *Q. lusitanica Broleri* above mentioned. These plants, of which there are more than twenty, are all just alike, thus disposing of any suggestion of hybrid origin, and seem to me exactly to reproduce Dr. HENRY'S botanic account of the parent tree, which I had better quote, "Narrow leaves with triangular mucronate teeth, a cuncate base and long petiole." *Q. infectoria* is a very near relative if not merely a geographical variant of *Q. lusitanica*, being found farther east in the Levant, Palestine, Asia Minor, &c., but I have not got it, and only know it from seeing it at Kew, where there is a good plant about 25 ft. high. I hope next spring to get it grafted and added to our collection. It was first brought to England in 1822, but the Kew tree, which probably dates from 1860, is presumably the oldest, and perhaps the only one, now growing in England.

Q. lyrata (Walter), Overcup Oak.—A deciduous tree, which is found in Central and Southern North America, and which attains its finest proportions, 100 ft., in Louisiana. The fact that it was first introduced into England as early as 1786, and nevertheless can hardly be said now to be in cultivation, is conclusive as to its unsuitability for our soil and climate. I have never had a specimen at Aldenham, though if all goes well I shall have one before the year is out. There are two small trees at Kew, of which the Director will kindly let me have wood for grafting, so that I shall be able shortly to give it a trial, though I am not sanguine about the result.

Its natural position is in swampy, riverside land, with which I shall be unable to provide it. The foliage has the merit of turning scarlet in autumn.

For a fuller account see "Trees of Great Britain," from which work some of the above information is drawn. Mr. BEAN does not consider it sufficiently important here to include it in his popular book.

Q. macedonica (A. de Candolle).—This deciduous oak comes from the Balkans and from Gallipoli, of tragic memory, and is spoken of by Dr. HENRY as a small tree or large shrub. Our plants belong to the former category, that is to say, they all have one central stem and a defined leader. They are still young, the oldest being only 8 ft. high, but so far they are slim, neatly growing pyramidal trees with rather short laterals which call for little or no pruning. The leaves are lance-shaped, dark green, leathery, rather small, and, as remarked by BEAN, reminiscent of *Q. Libani*, though the habit of the two species is quite different. The same writer states that it was first introduced into England about 1890, and doubtless this is true so far as Kew is concerned, but the Tortworth specimen, which must now I should say, speaking from memory, be at least 30 ft. high, dates, I think, from a few years earlier. It appears to be quite hardy at Aldenham. The acorns, about 1 in. long, are almost sessile, and take two years to ripen. Naturally they have not yet been produced with me.

Q. macranthera (Fischer et Meyer).—This hardy, handsome, deciduous oak is a native of the Caucasus and Northern Persia. It was, *teste* Dr. HENRY, introduced into Germany before 1873, but does not appear to have reached our shores before 1895. We must have been early in the field to secure an example, for our oldest plant is already quite 25 ft. high, with a girth 3 ft. above ground of 2 ft. 3 in. It is growing freely and ought to make a fine tree; its existence is recorded in "Trees and Shrubs" in 1908 as well as that of the Kew specimen, which is therein stated to have then reached 20 ft. Botanically, it is closely allied to the Hungarian *Q. conferta*, and Mr. BEAN classes the two with *Q. Mirbeckii* as three "of the most striking oaks with large leaves." Judging merely from our own examples—a very unsafe method, by the way—I should say that the leaves of my *macrantheras* were not so large, so striking, nor so deeply lobed as in the case of our *confertas*; and that, as for the older of our *Mirbeckii*s, they cannot be called conspicuous for largeness of leaf at all. In respect of ornamental value these three species as they can be seen at Aldenham would catch this judge's eye in the following order—1 *conferta*, 2 *macranthera*, 3 *Mirbeckii*. Both the leaves and twigs of *macranthera* are markedly downy, and in this respect, though not so glaucous in tone, the tree recalls *Q. lanuginosa*. Although its natural habitat is Alpine or subalpine, it appears quite happy and at home in the English lowlands. Besides the type, I have two trees 13 ft. 6 in. and 13 ft. high respectively, which I bought on the Continent under the name of *Q. macranthera Hort. Bot. Berol.*

English experts have thrown doubt on their being *macranthera*, on account of the absence of the down which is so noticeable a feature in this species. One indeed went so far as to say he believed they were merely forms of our pedunculate, but whatever else Germans may do or have done, I hardly think that the authorities of the Berlin Kew would have given the name of *macranthera* followed by their own to a form of our English oak. I think it far more probable that they are hybrids of *macranthera*, possibly fertilized by a pedunculate. Naming oaks, however, when not in fruit is, as I have written elsewhere, but a hazardous affair.

Q. macrocarpa (Michaux), Burr Oak.—Though I have only little seedlings of the type, only one of which is as much as 4 ft. in height, yet oddly enough my varieties make a much braver show. Two plants called *Q. macrocarpa Herrenhäusen* are 18 ft. 6 in. and 14 ft. respectively; these are obviously true to name, and the only thing that I can discover which distinguishes them from the type is that they have not the deep sinus between the lower lobes of the leaves, a feature which usually serves to separate *Q. macrocarpa* from the kindred *Q. bicolor*. One known as *discolor* is also 14 ft.; another labelled *Albertii* reaches 9 ft., but this last, though coming under that name, has been pronounced by experts to be *Q. velutina*.

Though originating in Eastern North America, and like all the other white oaks from that quarter of the globe very difficult to domesticate

in England, our plants show no sign of ill-health, although they have not progressed very rapidly. In appearance it is very like its close relative, *Q. bicolor*, but lacks the shaggy bark, and has more deeply-lobed leaves than the latter. It was introduced in 1811, but has always been rare, and the finest tree recorded by Mr. ELWES at Eastnor Castle was not more than 40 ft. high, though in its own habitat it is one of the tallest of the genus, sometimes reaching as much as 170 ft.

Owing to their general similarity of appearance few besides collectors would want more than one of the three Eastern white oaks, *alba*, *bicolor*, and *macrocarpa*, and having regard to the small likelihood of *alba* ever attaining maturity here, I should recommend *bicolor* in preference to either of the others, principally on account of its conspicuously shaggy stem.

Besides the three above-named varieties of *Q. macrocarpa*, I have two hybrids where this oak has supplied the pollen, one being crossed with *Q. alba* and the other with *Q. Toza*, which are both dealt with under those headings.

Q. marylandica (Muenchhausen).—Of all the members of this genus this is, I consider, the handsomest in foliage, though in habit it cannot claim nearly so high a place. Its leaves are large, leathery, and irregular in shape, recalling both those of *Q. cuneata* and of the fig-tree; they are of a rich dark green and carry a very high polish on the upper side, while underneath they have a brownish buff and hairy surface. I have two healthy plants, of which the taller is only 12 ft. high.

They are not rapid growers nor trees which readily make a good upright leader and symmetrical form; they are generally but sparsely branched, and unless judiciously pruned are disposed to a rugged outline. The most shapely and promising young tree of this species which I have ever seen is in the grounds of my friend Mr. CHARLES ELEY, at East Bergholt, in Suffolk; writing from memory, I should say it was about 20 ft. high.

They figured for a long time in our arboretum as *Q. nigra*. It is very confusing that besides the true *Q. nigra*, or Water Oak (see later), there should be two others, this and *Q. velutina*, which have the synonym *nigra*.

It never attains apparently more than 50 ft. in its native home, so cannot be of great importance from anything but an ornamental standpoint. It must, I suppose, be rare here, considering that Mr. ELWES thought my plant, though then a mere stripling, worthy of being chronicled. Having regard to its being so distinct, conspicuous, and hardy, it should be more planted, and is particularly suited to gardens in that it is never likely to take up a great deal of room, nor to make a very dense mass overhead. Anyone looking at it in summer without previous knowledge would guess it to be evergreen, whereas it is altogether deciduous. Neither of our plants has yet borne fruit.

Q. Michauxii (Nuttall).—Dr. HENRY broadly states in "Trees and Shrubs," p. 1309, that it "is not in cultivation." The plant which I bought under that name from the nursery at Muskau, in or about 1902, has merely existed for the last sixteen years, and is a shabby, unhealthy specimen; it has been examined by Mr. BRUCE JACKSON, a very careful observer, who pronounces it not true to name, though he is not able to say what oak it is. I can only say that, if he be right, it is one of the very few instances, out of a large variety of trees bought by me from that excellent tree nursery, where that charge can be justly brought.

No description is given of it in ELWES' book. Its habitat is the Eastern United States, southward from Delaware to Florida, and westward to Texas, Arkansas, and Missouri. As for its appearance when healthy, my plant forms no basis for an account at first hand. In support of Mr. JACKSON'S scepticism, I am bound to admit that the foliage of my example bears little resemblance to the leaf figured on the plate in "Trees of Great Britain." The Bureau of Plant Immigration at Washington are most kindly trying to obtain for me an undoubted specimen of this species.

Q. Mirbeckii (Durieu).—This is a fine hardy deciduous tree, somewhat in the same *genre* as *Q. conferta*, but not to my mind so striking or conspicuous. It usually reaches a height of some 60 ft. or more in England, but in its own habitat of Algeria, from which it was first introduced in 1845 or thereabouts, it is said to grow to double that height.

For a foreign oak it is fairly often to be found in English collections, and it is, I believe, worth growing for timber. Various fine trees ranging from 40 to 75 ft. are recorded in England by Mr. ELWES, but none of mine yet exceed 16 ft. 6 in. $\times$ 1 ft., and they are certainly not a good or showy form, for, however much they may differ botanically, the general effect of their foliage is not noticeably distinct from that of the English oak, though the leaves may be retained a trifle longer by this than by the indigenous species. A suspicion is steadily growing in my mind that these trees, though raised from acorns growing on a true *Mirbeckii*, have been fertilized by neighbouring pedunculates, and are really hybrids; I am not, however, botanist enough to express a confident opinion.

According to BEAN'S book, the leaves are from 3 to 7 in. long by $1\frac{3}{4}$ to $3\frac{1}{2}$ in. wide, but on the Aldenham trees, which number eight or ten, I have not found a leaf which exceeds 3 in. On the other hand, I have seen samples of the leaves of a *Q. Mirbeckii* growing at Ham Manor in which many of the leaves exceeded 6 in. in length and some attained 7 in., and as this specimen is 60 ft. high this is not one of those common cases where the foliage is abnormally developed, only so long as the plant is quite young and immature. The more I see of oaks (and in the process of preparing this article I have examined a great many besides those in our own collection) the more I realize how important it is to get a good form of a tree; the Aldenham *Mirbeckii* may be just as true to name as the Ham Manor or Tortworth

ones, and to a botanist might be the same thing, but to the man who grows trees for ornament, and such a man represents 99 per cent. of the specimen-tree growers, they are most inferior. So strongly do I feel this that, though I have plenty of *Mirbeckii* of a sort already, I hope if I live another twelve months to get the Ham Manor type grafted.

A feature which I have frequently noticed in this species is that in January and February, while the leaves still retain their green colour the leaf-stalk and lower part of the midrib take on a bright red.

This is not constant, for it has never occurred at Aldenham, where the leaves soon turn quite brown; but I have seen it in specimens from Surrey, Sussex, and Norfolk, and when it does occur it may serve as a means of identification, for I don't think it happens in the case of any other species.

Undoubtedly this is an oak which differs extraordinarily in the form and shape of its leaves, and that not merely, as is the case with many plants, when under cultivation, but also in its natural habitat.

Only last winter Sir JOHN ROSS sent me up the leaves of a plant of his which he had bought many years ago under the appellation *Q. Zan* or *Q. Zeen* (which last is a French corruption of the Arab name (*n'zān*) for this oak, and is a syn. for *Mirbeckii*), expressing at the same time grave doubts whether they were true to name. Nothing more unlike the broad leaves with regular dentation of a typical *Mirbeckii* would it be possible to conceive than Sir JOHN ROSS's samples; they were long, narrow, and had irregular jagged edges, and in shape and size much more suggested *Q. pseudo-Turneri* than they did *Mirbeckii*. I showed them to a well-known practical expert, who declared that whatever else they were they certainly were not *Mirbeckii*. Since then they have been examined in the Royal Botanic Gardens, Edinburgh, by Mr. SMITH, who pronounced them to be an eccentric form of *Mirbeckii*. "Who shall decide when doctors disagree?" My only reason for inclining to the Edinburgh view is that Sir JOHN's leaves, though retaining the summer green, had turned bright pink or red so far as the base of the midrib and petiole were concerned. This, as I have said before, is a phenomenon, trifling enough perhaps, but to the extent of my knowledge confined exclusively to the species under review.

The truth is that no expert, however clever, can always be positive about oaks from observation of the leaves alone. "By their fruits ye shall know them" is as true in botany as in morals. For arboriculturists an admirable modification of the old Latin motto "*Fronti nulla fides*" would be to read "*Frondi*" for "*Fronti*"! You can with no greater confidence pronounce on people's characters from their faces than you can classify trees into species by their leaves.

Last year my friend, Mr. VICTOR AMES, kindly gave me a small plant of *Mirbeckii* of which the foliage differs so widely from the type that I feel justified in giving it a varietal name and calling it after the donor, who raised it from the acorn in his garden at Thornham,

in Norfolk. So little did it resemble an ordinary *Mirbeckii* that Mr. AMES thought that it must be a hybrid; but neither I nor others far more competent to pronounce on such a point see any reason to doubt that it is other than a pure though very freaky example of Mirbeck's oak. I may mention that in the case of this tree, as in that of the one of Sir JOHN ROSS mentioned above, the same phenomenon of the red midrib and petiole was observable.

In the *Revue générale de Botanique* (1892), vol. iv. pp. 1-6, is to be found a short but exceptionally interesting paper by the well-known French botanist L. TRABUT, on the variations of *Quercus Mirbeckii* in Algeria. He has evidently spent a great deal of time in closely investigating the wide area of that country over which this oak is spread.

He regards it as very close indeed, to our English oaks, and especially to *Q. sessiliflora*—indeed, I gather that he looks on it as little more than a geographical variant, and alleges that the points of difference usually emphasized are inconstant and untrustworthy. The best distinction, in his opinion, is the greater number of lateral nerves in *Mirbeckii*, 9-15, than in *Q. Robur*, where they are usually 6-9, but in the case of *Q. Mirbeckii subpedunculata*, of which a leaf is figured in his work on Plate 3, fig. 16, even this distinction disappears, for it has only 8 or 9. Indeed, in the case of the Aldenham examples, I have found it to be as few as seven on each side of the midrib. The plates clearly represent about twenty different types of leaves which diverge to a startling extent. They appear to be sometimes pubescent, sometimes glabrous, some, from dry situations, are small, thick, and leathery, others large, thin, and papery. The older trees at Aldenham, I may here interpolate, are small, but by no means thick or leathery. Some have a sharply pointed apex, some are so rounded off as virtually to have no apex at all; some, in fact the majority, have a neat regular toothing or "crenellation," as TRABUT calls it, on their edges, while others have irregular though not very pronounced lobes. No leaf is figured by him longer than about $4\frac{3}{4}$ in., but some are only $1\frac{1}{4}$ in., and in width the variation is from $2\frac{1}{4}$ to $1\frac{1}{4}$ in.—in fact, according to the type at which one was looking, one might with equal truth write, "This species has a long narrow leaf," or "This species has a broad short leaf." If all foliage varied to this extent it would be impossible to describe it at all. Some trees, again, are recorded by TRABUT which bear large leaves in spring and narrow ones in summer. Mr. ELWES states that the leaves remain green till February or March, and I think this is the generally accepted notion; but according to TRABUT, though it would be easy to select trees with persistent foliage, that is not the usual case in their own Algerian habitat. At Aldenham the leaves of the older trees (about thirty years old) turn brown and fall in autumn.

TRABUT speaks in praise of COUTINHO PEREIRA's valuable study of the oaks of Portugal, in which he treats *Mirbeckii* as one of four varieties of *Q. lusitanica*, the other three being *alpestris*, *Broteri*,

and *faginea*. Whether *Mirbeckii* be regarded as a species or a variety, it seems to be as rare in Portugal as it is common in Algiers. TRABUT remarks in this connexion (I translate freely from the French) that the oaks of the *lusitanica* group both in Spain, Portugal, and the East are very variable, and a critical examination of all the types would enable one greatly to reduce the recognized species and replace them with varieties induced by soil or climate. Such an investigation, he wisely adds, will have to be undertaken on the spot, as herbarium samples are liable to lead one astray. I can only take him to mean by this passage, coupled with what he had previously written about the similarity to *Q. Robur*, and the unreliability of the characters usually assigned to *Mirbeckii*, that he would be inclined to throw *Q. pedunculata*, *Q. sessiliflora*, *Q. lanuginosa*, *Q. lusitanica*, *Q. Mirbeckii*, and doubtless *Q. conferta*, and probably other European oaks, into one species! For instance, though he does not mention it, if these are to be lumped together, I don't see how the Caucasian *Q. macranthera* can be kept out of hotchpot, for it is very close to *Q. conferta*.

TRABUT gives the following six varietal names to different types which he came across in Algeria—*tlemcenensis*, *brevipetiolata*, *microphylla*, *fagifolia*, *angustifolia*, *subpedunculata*. He then proceeds to treat them as the more Eastern equivalents of the varieties of *Q. lusitanica* given above by PEREIRA, pairing off *Q. M. tlemcenensis* with *Q. l. Broteri*, and *Q. M. brevipetiolata* with *Q. l. faginea*, and *Q. M. microphylla* with *Q. l. alpestris*. He also speaks of this Algerian form approaching, and of that one recalling, one or other variety of *Q. lusitanica*. Enormously as one extreme of *Mirbeckii* foliage differs from another, I believe if such an investigation of the Algerian forests as he talks of were carried out, it would be possible to find intermediate links between the type and all its varieties, and either to say that there were over 100 varieties of the species, or preferably that the species was so inconstant that it was impossible to lay down any feature which could be defined as the unvarying characteristics of any named variety.

I confess that the reading of TRABUT's clever paper is to produce on my mind a feeling of hopelessness and confusion. Certainly it tends to confirm what I had already realized, the utter impossibility of determining a species by looking at its leaves, and yet leaves are what the world at large goes by, in forming an estimate of a tree, and from the ornamental standpoint they are one of the most important, if not the most important feature.

But another and larger conclusion is forced upon me: in how inchoate and undetermined a condition must the science of botany still be when on the one hand we have American men of science turning out new species of *Crataegus* as a baker does rolls, and for a set-off a famous Frenchman lightly proposing to knock half a dozen old-established and accepted species into one. Meanwhile the unhappy amateur like myself continues his wail, "Oh, do explain what constitutes a species," but, alas, nobody mentions, for nobody

knows. My scepticism as to the existence of any recognized standard defining a species has been further increased by happening to read that another distinguished French botanist, ALPHONSE DE CANDOLLE, was inclined to treat "the three principal Pacific white oaks, *Q. lobata*, *Q. Douglasii*, and *Q. Garryana*, as mere forms (not even meriting varietal rank) of the European *Q. Robur*!" In spite of the fact that there is no general agreement as to what constitutes a species, and that the features which are supposed to determine one, such as pubescence, are constantly known to be inconstant, such trifles form no bar to the manufacture of new species any more than to pubescence or the like being relied on as fixing the species to which a plant belongs.

Q. mongolica (Fischer).—This name is frequently given by nurserymen to *Q. lanuginosa*, which hails from South Europe. The true Chinese species can hardly be said to be in cultivation, but I have a small plant in the nursery which was given me two or three years ago, I think, by Mr. ELWES, whose own soil is not, unluckily, generally suitable to the growth of exotics. A full account of this species is to be found in "Plantae Wilsonianae," vol. iii. pp. 230-2, though, unfortunately, I fear that the ordinary average reader will, after he has finished it, not be likely to have a much clearer impression of the characteristics of the tree than when he began. There is also a leaf figured in "Trees of Great Britain," Plate 337, fig. 48. This oak, *Q. grosseserrata* and *Q. crispula*, are all three so closely allied that it seems very unlikely that they will continue to be treated as three separate species—indeed, in WILSON'S book above mentioned *Q. grosseserrata* is treated as a variety of *Q. mongolica*, whilst Mr. ELWES, following the Japanese botanist SHIRASAWA, only describes one species, viz. *grosseserrata*, and merely mentions *mongolica* and *crispula* incidentally in notes. Having plants of *Q. grosseserrata*, it does not distress me that I have no *Q. crispula*, for I understand that even if I were to live to see them both in fruit—a most unlikely eventuality—the only possible difference I could detect would be that the acorn cups of the former would be a shade shallower.

Q. morehus (Kellogg).—I know little or nothing of this small deciduous representative of the Western American oaks, except that it seems to be closely allied to, if not a mere variety of, *Q. Kelloggii*, which it resembles in foliage, though it is not so deeply lobed. It is regarded by Professor SARGENT ("Manual," p. 255) as being a hybrid between that species and *Q. Wislizenii*. The acorns, which I have seen figured, are long and narrow, and protrude beyond the cup to the extent of two-thirds of their length. I have never seen the tree, which when mature has widespread straggling branches; as far as I know, it is not in cultivation here; indeed, it is stated to be rare in its own habitat, the foothills of the Sierra Nevada. The specific name is not formed on the customary botanic plan, and was given by its discoverer, Dr. ALBERT KELLOGG, a native of Connecticut, who seems to have known more about trees and Old Testament history than he did of Latin. The appearance of this oak having reminded him of

Abraham's oak, which is a variety of *Q. coccifera*, he, desiring to name it after "the land of Moreh" (Gen. xii. 6), the first place in Canaan where Abraham halted, formed Moreh into what he regarded as a latinized adjective, "Morehus"; it has the disadvantage of making a false concord with the feminine word *Quercus*, but the name has none the less been adopted by botanists, who are not sensitive about such trifles as genders. See remarks later in this paper *sub Q. Vibrayeana* as to *Liriodendron tulipifera* and similar horrors. An excellent drawing of this oak by the above-named Dr. KELLOGG is reproduced in "West American Oaks" by Professor E. L. GREENE (1889). It has of course no economic or timber value.

Q. Muehlenbergii (Engelmann), the Yellow Oak.—Dr. HENRY writes in 1910: "The only specimens which we know of are two trees about 8 ft. high at Aldenham, which were procured about eight years ago from a German nursery (Muskau)." These trees in 1918 have gained about 3 ft. in height and are still alive, but I can put it no higher, for they are neither happy nor healthy, and so far must be reckoned, along with our dubious *Q. Michauxii* and the Japanese *Q. dentata* or *Daimio*, as among the comparatively few failures in hardy oak cultivation which we have to admit.

As a counsel of despair I last year cut them both hard back, leaving little but the stems, as I have found from experience that such drastic treatment will sometimes restore the lacking vigour by minimizing the work which it is incumbent on the roots to perform; and in this case too a good result has been obtained.

It makes a very tall slender tree in its native country, North America, where it is very widely distributed, but it is of the greatest rarity in European cultivation. My plants are too poor for me to be able to describe its appearance from my own knowledge. In BEAN'S "Trees and Shrubs" it is treated as a near ally of *Q. Prinus*, under that heading, but in ELWES and HENRY'S "Trees of Great Britain" it is accorded specific honours.

Q. nigra (Linnaeus) syn. *aquatica*, the Water Oak.—I had long neglected to get this species, having been deceived by the fact that our *Q. marylandica* came to us under this synonym. To increase the muddle I see from "Trees of Great Britain" that no less than three other oaks, viz. *Q. cuneata*, *Q. heterophylla*, and *Q. velutina*, have been given the name of *nigra* by one or other of the botanists. It further illustrates the confusion still existing with regard to tree nomenclature, that when I did at last obtain two specimens of the true *Q. nigra* they were sent out as *Q. laurifolia*, a name which rightfully belongs to a rare Californian evergreen oak of which I have given an account earlier in this paper.

It seems strange, having regard to the numbers of foreigners of this genus which would thrive in, and adorn, pleasure-grounds in Britain that I know of none excepting *Q. rubra* and *Q. coccinea* which are regularly stocked by British nurserymen; of course all French nurseries are just now hopelessly disorganized by the war, and, though

the German ones may not have suffered in the same degree, there are but few of us to whom trading with the enemy, even if and when legalized, would present any attraction. Ignoring all rarities, supposing that I wanted such well-known ornamental trees as *Q. Phellos*, *Q. conferia*, and *Q. Toza*, I should not know where to go for young plants. In fine, I believe that, widely as the taste for arboriculture has increased of late, it would be more difficult now than it would have been fifty years ago to form a representative collection of oaks.

The leaves of this kind vary so much from deep-lobed ones to others like those of *Q. Phellos*, long and narrow with no lobes at all, that I must refer your readers to botanical works for a proper account of them.

The tree itself was first introduced to Europe as far back as 1723, but never seems to have caught on here, though it is approved as a shade tree in its own habitat, the Southern States of the Union.

Mr. ELWES mentions that, though not actually evergreen, it retains its foliage fresh and green till January or February. This is a strong point in its favour, and makes it the more surprising that so little use has been made of the Water Oak in this country. It is possible that, as its natural site is in damp swampy places, some parts of England might prove too dry for it.

It is closely related to its more Southern ally, *Q. laurifolia*, a tree much less often to be found in European cultivation.

Q. obtusata (Humboldt and Bonpland).—This oak, though coming from Mexico, has the advantage of being perfectly hardy in this country, into which it appears to have been first introduced towards the end of the first half of the nineteenth century. It is deciduous, but holds its leaves until the spring. The leathery obovate leaves average about 4 in. long by 2 in. broad; are rounded at the apex and narrowed at the base, dark green above and pale green below; they have a markedly ribbed surface and are toothed on the margins, the ovoid acorns, about $\frac{3}{4}$ in. long, ripen in one season.

I have seen the fine specimen in the Cambridge Botanic Garden, which is recorded by Mr. ELWES, and also the much smaller one at Kew, and there is another at Westonbirt, which I must have seen but cannot recall. I have none, I am sorry to say, at Aldenham, but am arranging to have a couple of specimens sent me from America during the course of this year, so this gap ought soon to be filled. I know very little of this species at first hand, and must refer readers to "Trees of Great Britain" and other botanical works for fuller and better accounts than I can give. It is said to make a grand tree in its native mountains.

Q. oxyodon (Miquel).—This is an oak which WILSON collected in China in 1900 on his first journey there, when in the employ of Messrs. JAMES VEITCH, who in their day rendered so much service to horticulture. It is closely related to the Himalayan *Q. lineata*, and in many works, including HOOKER'S "Flora of British India," it appears as *Q. lineata* var. *oxyodon*, but I am following the advice of the Director

of Kew, and the opinion of REHDER and WILSON in "Plantae Wilsonianae," vol. iii. p. 228, in treating it as a separate species.

I hardly know whether *Q. oxyodon* should be described as deciduous or evergreen, for it is betwixt and between, as it throws off all its leaves every year, but retains them till the spring, when they are pushed off by the new-comers. Its distribution is not confined to Western Hupeh and Eastern Szechwan in China, where it is a common forest tree at a high level, but it is also a native of the Khasia and Naga Hills in Assam, 3000 to 5000 ft. up. Its life has been too short yet in this country to speak with perfect confidence as to its future, but there seems no reason to fear that it will prove tender, and the plants which I have seen look healthy enough.

I owe the possession of one little specimen of this very rare oak, which is grafted on a *Q. Ilex* stock, to the kindness of the Director of Kew, who has also favoured me with the following botanical account, which I transcribe: "A low-growing tree with widespreading branches, which form a broad flattened crown; branchlets angular and glabrous. Leaves oblong-lanceolate, acute or acuminate at the apex, somewhat acute or more or less rounded at the base, closely and prominently spinous-serrate on the margin, except at the entire base, somewhat leathery, shining above, covered with a close, dense, whitish felt beneath, sometimes becoming almost glabrous with age, 4 to 8 in. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ in. wide; midrib and lateral veins very prominent beneath, lateral veins nearly parallel and straight, 18 to 25 on each side of the midrib; leaf-stalks rather slender, glabrous, $\frac{3}{4}$ to 2 in. long. Fruit maturing in the first year, solitary or a few together on short peduncles near the ends of the branchlets. Ripe cups hemispherical, thin, $\frac{3}{8}$ in. across, scarcely $\frac{1}{2}$ in. deep, with about seven hoary tomentose toothed concentric rings. Acorns hemispherical, truncate at the base, rather more than $\frac{1}{2}$ in. long and broad."

The above has the merit of being far more lucid than the average botanical accounts with which I have had to contend, and would, I really believe, enable anyone of fair intelligence, who was at all familiar with plant life, to identify the foliage and fruit of this species.

Q. palustris (Muenchhausen), Pin Oak.—This is a very attractive oak, too much like *Q. coccinea* for anyone who is not a collector to want them both, unless indeed there is a great deal of planting space. Though its red autumn colour is pleasing, it is not usually so vivid as that of *Q. coccinea*. As I have seen it growing in the United States, it seems generally to take a pyramidal shape, tall and slim with a straight stem, and not sprawling about as the somewhat similar *Q. rubra* is inclined to do. It happens to be the first exotic oak of any interest (the Turkey Oak cannot be counted in this category) of which I became possessed, consequently it is the biggest of these at Aldenham. Its height is now 37 ft., with a girth of 4 ft. 6 in. at 3 ft. from the ground. Had I not neglected to prune it in its youth it would have been much taller; as it is, it has been allowed to fork at a height of about 15 ft. and then forms a large spreading head, so

that, though not otherwise than ornamental, it is not a fine specimen from a forester's point of view. I suppose it must now be about forty to forty-five years old. I have another much younger tree of the same species which I did treat rather drastically a few years ago, and with the best results; it is now as correct in outline as those admirably pruned planes adorning the Mall, which were the subject of violent and ill-informed criticism some ten years ago in *The Times*. This tree is 20 ft. high, with a girth of 1 ft. 4 in. Judging from the relation of girth to height in this tree, I estimate that had the older one, girthing 4 ft. 6 in., been properly pruned it would have now scaled at least 60 ft. in height instead of 37 ft. ! The branches in this tree are generally slender, which gives it an elegant and graceful look. It has been an alien immigrant for over a century, and with the exception of *rubra* and *coccinea* is the most often planted and one of the best doers here of any of the American oaks. Mr. ELWES notes a tree in Windsor Park 113 ft. high in 1910.

The colour of the dying leaves in 1919 was exceptionally fine. It was not the bright scarlet of *Q. coccinea splendens*, but a deep dark crimson merging into claret colour.

There is a weeping variety of this species, *Q. palustris pendula*, which I do not possess at present, but which is to be seen at Kew, and which I hope to get grafted on a *rubra* stock and have growing at Aldenham in the course of next year.

Q. pedunculata (Ehrhart).—This in our neighbourhood is, with the exception of *Ulmus campestris*, the commonest hedgerow tree, and as a general rule grows very well, though I know of none which has attained exceptional dimensions. The best tree in our grounds, growing in the open, is 64 ft. high, and has a girth 3 ft. above ground of 14 ft. 6 in.; it is a fine old fellow (see fig. 20), and as yet shows no signs of decay, but it would pass quite unnoticed alongside of the giants in the park of Lord POWIS. The main stem has been allowed to fork at a low level, which of course detracts from its value as timber, and contrasts markedly with those growing close by in the home wood (see fig. 21), which in this respect are very fine. They must originally have been grown in close canopy, and show straight clean boles 25 ft. or more high without a branch. The tallest of these reaches 65 ft., a foot higher than the one last described, but in girth it is in no way remarkable, and neither in this case nor in any in the wood have I found one that attains to 12 ft., still the impression of dignity and quality produced by these tall columns, almost entirely unmarred by epicormic growth, is very good, and would make any woodman lick his lips. During the war, when there was such a scarcity of timber, I trembled lest they should be commandeered by the Government.

While I am on the subject of pedunculates I should like to mention one at Aldenham which has no botanical interest, but of which I know the chequered career from the acorn to its present age of seventy-three. The acorn was planted without much consideration for the future on the lawn in the autumn of 1846 to commemorate the birth of my eldest



FIG. 23.- *QUERCUS PEDUNCULATA PENDULA*.
Height 33 ft.; girth 3 feet from ground, 3 ft.

(To face p. 202.)



FIG. 24.—*QUERCUS PEDUNCULATA FASTIGIATA*.

brother, which had taken place in the preceding April. By the time my brother and the oak were in their forty-fourth year, *i.e.* in March 1890, it had grown into an exceptionally fine shapely tree, which not only spoilt the lawn-tennis or croquet ground, but also obscured all view of the park from the drawing-room windows. My father wanted to cut it down on utilitarian grounds, and my mother to preserve it on sentimental ones. A compromise was arrived at, and it was decided to attempt its removal to the park. This was a big undertaking, for the English oak being such a bad mover when more than about ten years old, it was hopeless to expect it to survive removal at forty-four unless a very large ball of earth accompanied the roots. I cannot now say with any certainty how heavy the ball was, but I should guess about 15 tons; anyhow, I know that it took seventeen strong farm-horses to draw the tree up an inclined plane of boards over the low terra-cotta wall which encloses the pleasure-grounds and down to its new site in the park, about 300 yards away.

The result on the whole was a success. It is true that the top of the tree for a distance of 10 or 12 ft. died, but the rest of it thrived, and it now stands a fine straight stem girthing 5 ft. 8 in., with a well-balanced though pollarded head, attaining 36 ft. in height. An English oak of that age having been able to withstand the shock of removal is only explicable by the fact that some brick footings of an old barn or other building, the line of which showed in dry weather and spoilt the look of the lawn, had been removed about four years before, and had incidentally led to the neighbouring tree being heavily root-pruned. I have also several pedunculates, which are seedlings from one at Tortworth known as the "glossy oak," now about sixty years old. This variety is described in "Trees of Great Britain," vol. ii. p. 287, as follows: "It has remarkably glossy coriaceous leaves, somewhat variable in shape but generally obovate-lanceolate, with quite entire or only slightly lobed margin."

I have also fourteen named varieties of the pedunculate oak, and of these one of the most attractive and picturesque is *pendula*, as can be seen by looking at fig. 23; it is growing very freely, and, situated as it is on a bank of the lake, it ought in a few more years to form a very striking object. I suppose it is now thirty years old, and has a girth of 3 ft. and a height of 33 ft. I have also quite recently bought from an English nursery another weeping form called *pendula Dawesii*; it is distinct from the former, and is 9 ft. 6 in. high, but too young for me to say much as yet about its merits.

Almost in startling contrast to the two last named are my specimens of the variety *fastigiata* (fig. 24), with their stiff poplar-like habit. We have about half a dozen of this variety dotted about the grounds, and they are undoubtedly valuable in breaking the line of any plantation, with the special advantage that they take up very little room. I suppose it must be regarded as a freak when the branches of an oak, a lime, a thorn, an alder, a birch, a Gleditschia, a tulip-tree, or an elm (and I have rigidly fastigiate forms of all these at Aldenham) grow

perfectly vertically, and yet no one looks on it in that light when a juniper or a cypress is in question. My three tallest examples of this oak reach 28 ft., 23 ft., and 21 ft. respectively.

This variety was discovered about 1750 in a German forest, and is still a favourite ornament of tea-gardens in that country. It sometimes comes true from seed, and Dr. HENRY records an experiment at Nancy where out of thirty acorns sown twelve took an upright form and the balance reverted to type. I have also a fastigate oak labelled *Q. pedunculata fastigiata monstrosa*, but there is nothing in the form of its commonplace leaves nor in the growth of its branches which is at all monstrous, yet the habit of the tree is different from, and it is certainly not the same variety as, the *Q. fastigiata* to be seen at Aldenham and many other places. Another variety, *fastigiata Grangei*, is also to be seen here, and has reached 16 ft. 6 in. in height; this is more bushy than the last, and might perhaps more aptly have been called *pyramidalis* than *fastigiata*.

Of variegated forms I have one, called *variegata*, which has the curious feature that, though the first spring foliage is ordinary and typical, the second or summer growth is always boldly marked by white splashes, denoting, I presume, some want of chlorophyll. It is easy enough to accept this as a general cause of variegation in foliage, but it is difficult to see how it can apply to the second and not to the first of the season's growth. Mr. BEAN mentions that they have at Kew an oak with the same peculiarity. My plant is 28 ft. high, and has a girth 4 ft. above ground of 2 ft. I have another tree labelled *Q. pedunculata foliis maculatis* in which the variegation is constant.

So much for white-leaved oaks; as for the variety *concordia*, the best-known golden-leaved form, BEAN says that it has a bad constitution, and I can so far bear him out that I must admit to have lost examples which I once possessed, and can only now show quite young plants, of which the tallest is but 13 ft. high.

Q. pedunculata leucocarpa, which is in much the same style, has leaves rather of a primrose-yellow than of an orange-gold colour. A seedling oak, one of a batch which was raised at Aldenham many years ago for ordinary forestry purposes, developed foliage brightly splashed with yellow, but, though it retained this feature for several years, it ultimately grew out of it. Another pedunculate which was bought at Muskau, of which all the leaves had a neat silver edging or margin, became an ordinary oak after living two or three years on Aldenham clay. Considering that variegation arises simply from deficiency of chlorophyll, it is not unnatural that as a tree increases in vigour it should shake off its parti-coloured habit and revert to the normal green, but I have noticed that this is particularly likely to occur when the subject has recently been transplanted, and this I should not have expected, as such removal must for a time weaken the plant's health.

I have had, however, two disconcerting proofs of the truth of this dictum. Many years ago, when I must have had more cash than

brains, I gave £5 for an extra large and showily variegated horse-chestnut, which, from the first season that it bore leaf at Aldenham till ten or twelve years later when I arose in wrath and had it destroyed, never had any variegation which could be seen without a magnifying glass. Again a few years ago I moved a purple form of *Acer platanoides* from one place to another in the grounds, the next spring no purple was observable, and, though in later years the dark colour came back to a certain extent, it was never so marked as it had been before removal.

Besides these yellow and white-leaved varieties there is another called *atropurpurea*; this is less often seen, and has rich dark purple foliage of as deep a hue as is ever seen in the case of a copper-beech. Though quite healthy, it is an amazingly slow grower, and is very little larger now than it was sixteen years ago when I first got it.

Of varieties with distorted or malformed leaves I have both *Q. pedunculata heterophylla*, 19 ft. in height, and *Q. pedunculata heterophylla cucullata*, a symmetrical tree also reaching 19 ft., of which the foliage is long, narrow, and distinctly hooded (though not so conspicuously so as in the case of *Broussonetia papyrifera cucullata*) and *Q. pedunculata filicifolia* or *pectinata*, in which the leaves are shredded, indented, and cut right down to the midrib, so as entirely to destroy the natural look of the leaf and to produce the likeness of some outlandish fern frond. Like the fastigate variety mentioned above, this oak also originated in Germany. Lastly, I must not omit among distorted forms our *Q. pedunculata contorta*, about 13 ft. high, in which the short, roundish leaves are crumpled up and puckered together, somewhat in the fashion of *Laburnum monstrosum*.

In all these cases of non-natural leaf formation, only fit, as some of my friends consider, for a sylvan chamber of horrors, the trees bearing them seem to lose their usual vigour and nearly always prove bad doers and "miffy" subjects. I was more attracted by these vegetable freaks in "my green unknowing youth" than I am now, but I must confess that *Corylus Avellana contorta* still has attractions for me.

There is also a curious variety, *Q. pedunculata contorta*, as far as I know a unique specimen, in the nursery garden of Mr. H. B. MAY, at Chingford, in Essex. Though it bears the same varietal name as our oak it is a perfectly distinct form, for in this case the foliage is normal and its eccentricity is shown in the branches; it might be better to call it var. *ramulis contortis*, for it grows a mass of twiggy boughs turning in all directions, producing the effect of a bird's nest. It was figured in the *Gardeners' Chronicle* under date January 13, 1912. I have had cuttings struck of it, and am now taking steps also to have it grafted.

I have also *Q. pedunculata grandifolia*, an exceptionally handsome oak with very large leaves; it is well grown and vigorous, 22 ft. high with a girth 4 ft. above ground of 1 ft. 7 in. It came to me from a Continental nursery about twenty years ago with the name

Q. sessiliflora longifolia, to which the stalked acorns when they appeared gave the lie.

I have now come to the last of my pedunculate varieties, *tardissima*, which is certainly neither a freak nor "miffy," for a stronger, more thriving tree it would be hard to find. Its varietal name is meant to indicate that it is later coming into leaf than the type, and in my experience this claim is well founded. I watched my two specimens closely this year, and no leaf buds appeared till June 1, though the trees were in full leaf by the 15th. It is strange that Mr. ELWES should write in his book, and that Mr. BEAN should tell me that at Colesborne and Kew respectively they have not observed that this tree deserves its name. Undoubtedly with me this and an oak which I believe to be a hybrid of *Q. Toza* and *Q. lanuginosa* are far away the two latest of the genus to come into leaf. I am not a botanist enough to point out in what essentials, if any, it differs from an ordinary pedunculate, but the general effect is quite distinct. I should expect any tree-lover noticing it for the first time to say "Hullo, what oak is that? I am sure it is not a common one, but I can't put a name to it." It is of a much darker, richer green than the common oaks about it, and quite as noticeably different from them in the general effect produced, as, say, our *Q. Mirbeckii*. I believe my plants are due to the kindness of Mr. ELWES, who has done so much to help me in my arboretum. I observe that he adds a note to his account of this variety that seedlings raised by him do not seem to retain the late-leafing habit.

In the summer of 1917 all the pedunculate oaks in our neighbourhood were almost entirely defoliated by the larva of the green oak moth, and in this respect the pedunculate is at a great disadvantage compared with the sessile oak, which is nearly immune from the disfigurement if not injury caused by this pest. Mr. GERALD LODER informs me that in the Sussex woods adjoining Wakehurst, his beautiful Elizabethan house, the caterpillars, not content with stripping the oaks, dropped down on the choice Himalayan rhododendrons planted below and ate off all the young shoots. As even rabbits, which are almost omnivorous with regard to vegetation, will starve sooner than eat most rhododendrons,* it is strange that *Tortrix viridana* should have been able to accommodate itself to this unnatural diet.

I have been particularly interested in reading what Mr. ELWES writes of his experiments in 1901 with a view to ascertaining whether "the size of the acorns and vigour of the parent tree had much influence" on the growth of the resulting seedling. My own limited experience entirely bears out his negative conclusion. A fine old oak close to the front door of Aldenham House bears exceptionally large acorns; we sowed a lot of these a good many years ago, but

* Of late years it has been found in Cornwall that some rhododendrons are not rabbit-proof, and at Caerhays they prey especially on one species, *R. oreotrophes*.

the produce were no way remarkable or superior in vigour to the most ordinary young plants which might be bought anywhere at so much a hundred.

Mr. ELWES has a great deal also of interest to say about natural reproduction of oaks, and justly points out that mice are one of the greatest enemies with which young seedlings have to contend. I myself have often noticed hundreds of tiny oaks springing into growth in the grass field adjoining a covert, when waiting, as forward gun, for the pheasants to come over, and have thought how rapidly England would revert to its old forest conditions if farming were to be suspended, and the accursed rabbit were to become a memory instead of a plague. In pre-war days, before Germany had made herself so loathed by the rest of the world, we used to be always having the excellence of German woodcraft thrust down our throats by those who did not realize how different are the conditions in the two countries. To name one instance alone, I have walked every day, for a month at a time, for three years running, in Bohemian woods, and during the whole period all the ground game I ever saw was one roe-deer and one hare. In England, however closely a forester may kill down the rabbits and hares, his trees are at the mercy of his neighbours, who may frustrate all his efforts.

The special liability of oaks to be struck by lightning has often been observed, and has always been very noticeable at Aldenham, where hardly a year passes without our having two or three on the estate destroyed by this cause, whereas to have elm or Lombardy poplar or other tree served in that fashion is quite an exception. A few years ago one of the finest oaks in our home wood was literally converted into matchwood by lightning, tall narrow splinters 20 ft. long being flung to a considerable distance. The explanation which has always been given me of lightning tearing a tree to shreds in this way is that the great heat converts the sap into steam, and so causes the stem to explode. If this be true, I cannot understand why a similar effect is not produced when men or animals are struck, since they contain much more internal fluid than any tree in proportion to their bulk.

Q. Phellos (Linnaeus), Willow Oak (fig. 25).—The natural home of this species is the Atlantic States of North America, but it has been established here for nearly two hundred years. Its thin, elegant, narrow foliage, so unlike the bulk of its congeners, makes it a general favourite, and it certainly thrives better in England than do the majority of the arboreal denizens of the Eastern United States. My oldest tree is 21 ft. high, with a girth at 3 ft. above ground of just under 2 ft.; it would have been taller but some years ago 6 ft. of the top was broken off in a gale, and it has been a slow and troublesome business to establish a new leader. I have also examples of three so-called varieties, which are labelled *latifolia*, *microcarpa*, and *sericea*, of which the heights are 7 ft., 18 ft., and 14 ft. respectively. I also had at one time, but have lost, another called *Q. Phellos dentata*. As to the first,

the leaves do not appear to me noticeably broader or larger than those of the type; and as to the second, neither this variety nor the type have ever borne acorns at Aldenham, so I can say nothing about their size. As, however, I read in BEAN that when *Q. Phellos* does bear acorns, which is very seldom the case in this country, they are not much bigger than a red currant, I cannot help shrewdly suspecting that the foreign grower from whom I acquired this plant mistook the natural tiny acorns habitual to the type for an exceptional case of abnormally arrested development. As to the third, I can observe no special silkiness to call for the name *sericea*, nor indeed any other peculiarities which would differentiate it from the type.

It is a great pity that so many nurserymen should be addicted to attaching to trees and shrubs grown by them varietal names which have only the slenderest justification. For instance, there are few commoner features in plant life than that the foliage of young trees should be bigger than is the case when the subject has reached maturity, and to put these on the market with grandiose appellations such as *macrophylla Jonesii* or *grandifolia Robinsoniana* is little more than a flat-catching trick, though it may be urged in excuse for Messrs. Jones & Robinson that they are probably as much deceived about the exceptional character of the plants which they sell as their buyers are likely to be disappointed later on. This kind of thing brings varieties into contempt, and leads to the misfortune that those really worthy of note are likely to be neglected or ignored in serious botanical works.

Excessive and wanton multiplication of varieties is undoubtedly a mischief, but is it not almost as bad to take up the narrow and bigoted line that one will have nothing to do with varieties and will only confine oneself to species? I confess to a feeling of irritation when a friend of mine well known in the gardening world responded to an offer of mine of a plant, "I shall be very glad to have it if it be a true species, but not if it be merely a variety." I suppose that every known species was once a variety, and that many varieties of to-day may in a few million years have become species. Again, I have no idea where varieties end and species begin, or vice versa, and though it may be truly retorted that such ignorance in an amateur who has made no study of botany is in no way remarkable, yet who is the botanist or man of science, however learned, who can answer the question definitely and satisfactorily? It seems to me that when the special features have become so far fixed in a variety that it can be counted upon to come true from seed, it has very nearly attained the dignity of a species, but I do not know that such doctrine is recognized.

It is not even as if there were agreement among the *cognoscenti* as to what constitutes a species. Take the case of the American *Crataegus*; their name is legion, and Professor SARGENT has named, classified, and described literally hundreds, yet, as the old Latin exercise book says, "There were some who laughed," and it is not only among nobodies and know-nothings that you will hear the

opinion expressed that many of these are merely geographical variants of the same species.

Again, it may well be that a plant has well-defined differences of construction or features of fruit or flower which fully justify its being regarded as a separate species, and yet leave it neither noticeably different externally from some well-known tree or shrub, nor in itself attractive or ornamental. The converse is also true that a tree may be botanically undistinguishable from the type, and yet be startlingly divergent in appearance, so that the uninitiated would not suppose it to belong to the same order.

How distinct is the look of *Robinia Pseudacacia monophylla* and of *Fraxinus excelsa monophylla* in eyes accustomed to the pinnate leaves of the so-called acacia and common ash! How much more effective and valuable in a pleasure-ground is a weeping ash, or a good form of golden elm or a fern-leaved beech than many a true species! Now I have made the best defence I can of varieties in which I have always been interested, and must get back to oaks, from which I ought never to have wandered.

Q. phillyraeoides (A. Gray).—This Japanese evergreen, like several others with persistent leaves whose home is in the East, will, I feel confident, never make a real tree here, and indeed in no place does it apparently ever exceed some 30 ft. in height. The older existing plants were first brought from Japan in 1861 by a collector for Kew, but the later introductions, such as my own plant, which measures but 1 ft. 3 in. in height with a spread of 2 ft. across, were introduced from China, and spring from acorns collected by WILSON. I have only had it two or three years but it seems already quite at home.

The oval leathery leaves are of small size and of a bright green colour, which is darker on the upper than on the under side. It makes a cheerful attractive bush and is well deserving a place in the shrubbery, although it is not much use recommending people to acquire plants like this when I should not have the wildest notion how to get another if I wanted it myself.

It possesses the great advantage of being quite hardy. I don't know how many degrees of frost would be required to kill it, but I can only say that it was entirely unaffected by the 33° with which we were troubled in February 1919, which proved fatal to *Q. incana*, and nearly if not quite killed three unnamed Chinese evergreen oaks besides very seriously injuring *Q. glabra* and slightly *Q. densiflora*. Of course its entire escape from injury may be due to the protection of snow which enabled many of my more tender plants to resist a cold which without it would have been fatal. It strikes me as particularly healthy, though evergreen oaks, with the exception of the *Ilex* and *Lucombe* type, do not as a rule take so kindly to our heavy clay as the deciduous kind. The specimen at Kew is about 16 ft. high. This species is described in "Plantae Wilsonianae," vol. iii. pp. 233-4, where it is stated that it is usually only a shrub in its own habitat but occasionally makes a small tree, 6 to 8 mètres high.

FRANCHET, probably wrongly relying on a treacherous likeness of leaf, and overlooking difference in fruit, regarded it as a mere variety of *Q. Ilex*. It is also described by Dr. HENRY in "Trees of Great Britain," pp. 1298-9.

Q. pontica (Koch).—I have a thriving shapely specimen of this uncommon Caucasian or Armenian oak. It was given me some five years ago by Mr. ELWES and is now 4 ft. 9. in. high, and as well as I can judge ten to twelve years old. For the last three years it has regularly borne three or four acorns, from which I have been successful in raising some promising seedlings. It is not unknown for quite young oaks to bear fruit, but this is the only occasion in my limited experience when the acorns have proved fertile.

My *Quercus Libani* had quite a crop of apparently fully developed acorns at a very early stage of its career, but not one of them would germinate. *Q. pontica* is described both by HENRY and BEAN as a shrub, but there is nothing shrubby about my plant—that is to say, it has one clean central stem, with a defined leader, and regular lateral branches, not set very close together. Though looking perfectly robust and happy, it is clearly a very slow grower, only increasing at the rate of two or three inches a year. I should describe it as an ideally healthy dwarf tree. With its large leaves, rigid growth, and pale green colour of the young wood, and in spring the profuse show of long slender brown catkins or tassels of flower, it presents a most noticeable and attractive appearance. It is still very rare in cultivation, the acorns having been only introduced into England as lately as 1905 by the late Lord KESTEVEN.

Q. prinoides (Willdenow), Chinquapin, Scrub Oak.—My best plant of this deciduous native of the Eastern U.S.A. is now 7 ft. high, which, considering that it is said never to exceed 12 to 15 ft. in its own habitat, is quite a respectable size.

Personally, I have never seen it growing elsewhere, though I might have done so both at Kew and Tortworth, and except on botanical grounds I see no special reason why anyone should take great pains to acquire it. The distinguishing feature of this oak, which separates it from any other with which I am acquainted, is that it increases by root suckers. Dr. HENRY describes the leaves as "4 in. long and 2 in. broad, obovate or ovate, acute at the apex, cuneate at the base"; he also mentions their fine "orange and scarlet colour before falling," but this so far has not been noticeable with us.

Having regard to the few years which it has taken in reaching 7 ft., I am inclined to anticipate that it will grow taller in the strong clay of Aldenham than it has ever been known to do on the stony, rocky hillsides and prairies of its own country. It was first introduced in 1823, but is still, has always been, and is likely to be, a rarity in Great Britain.

Q. Prinus (Linnaeus), Chestnut Oak.—Of this tree, which hails from the Eastern United States, we have only small plants not more than 2 ft. high. Though one of the earliest of foreign oaks to be in-

roduced, the date being certainly anterior to 1700, it is still far from common here, and it must therefore be assumed that, like so many trees whose natural home is east of the Rockies, it does not readily accommodate itself to European conditions. Messrs. ELWES and HENRY devoted much time and labour to the search for fine specimens of exotic trees before publishing their great work, but they failed to find any old or large examples of *Prinus*. *Q. Muehlenbergii*, which is so closely allied to it that it used to be classed as a variety thereof, has been growing (or to speak more accurately, standing still) at Aldenham for at least seventeen years, and is, as I have indicated under that heading, a pretty hopeless proposition. With this fact before us, and taking into consideration the history of *Q. Prinus* itself, there is no ground for expecting that it will do any better than its close ally. On the other hand, Mr. BEAN records that young specimens are thriving at Kew.

If it could be persuaded to grow, it would be indubitably worth growing, as the shining dark green obovate leaves, with their pale grey downy under side and conspicuous bright yellow midrib, are very striking. I have also a hybrid, *Prinus* $\times$ *alba*. As such hybrids of the first generation are often exceedingly vigorous, it is quite possible that this one may thrive better at Aldenham than either of the two oaks, of which it is a conglomerate. My plant is 9 ft. high, and so far is going strong.

Q. rubra (Linnaeus), Red Oak.—This being one of the first to be introduced and the commonest of American oaks to be seen in cultivation in Europe, it was naturally one of the first to be acquired at Aldenham. For an oak it is in early life a very fast grower, and our best tree. One on its own roots, given me about 1888 by the late Lord REDESDALE, is now nearly 40 ft. high, with a girth of just under 3 ft. at 3 ft. above ground level. This species has a general similarity to *Q. coccinea* and *Q. palustris*, but the leaves are larger, less deeply cut, and with a duller under side; the autumn colour too is usually inferior, and the habit of growth is looser and freer in this than in those kindred species. In respect of autumn colouring, this varies much in different cases from dull brown to bright red, but whether this be due to soil, climate, or to the characteristics of the particular plant, I cannot say; the colour seems to me to tend to become less brilliant as the tree gets older. When grown in the open as a specimen, it is inclined to produce over-long, weak, and spindly boughs, which if left unpruned give the tree rather a weedy aspect, and cause it to take up too much room for a medium-sized garden. On the other hand, it can be counted on to thrive in most English soils and situations, by no means a usual feature in a tree whose habitat is the eastern side of North America, Westerners proving as a rule much easier to acclimatize. It is too, of course, absolutely hardy.

This is not a tree which has given birth to many notable varieties, none are mentioned in ELWES, and only one in BEAN. This, which I possess, is a tall grafted standard, *Q. rubra aurea*, 20 ft. high, with

foliage self-coloured of bright soft gold. I can confidently recommend it as superior to the only two other all-gold coloured oaks with which I am acquainted, viz. *Q. pedunculata concordia* and *Q. pedunculata leucocarpa*. I know very well that to some tastes all of what they regard as unnatural colour in foliage is offensive, and appears to indicate disease. To my mind purple browns, whites, and yellows, if judiciously employed and not overdone, add greatly to the cheerfulness and gaiety of a pleasure-ground. Still, great care must be taken with them, for having none is better than to have too many, or to have them wrongly placed. Although two different living greens always seem to harmonize, yet that is far from being the case with other colours, as will quickly appear if you try planting copper hazel by a purple beech, or *Cupressus Lawsoniana aurea* alongside a golden elm. Again, too, many a villa garden has been vulgarized and ruined by great splashes of garish golden elder thrust in at random among the shrub borders.

We have also a variety of *Q. rubra* called *Schrefeldii*, which was bought at Muskau in 1902, and which is now between 18 and 19 ft. high. The leaves of this plant have very sharply pointed and very deep lobes which give it a distinct appearance, fully justifying a varietal name. This last remark also applies to another variety, *longifolia*, which, as the name implies, has markedly long narrow leaves. I have two plants of this bought at the same time and place as *Schrefeldii*, but they have not thriven so well, and I cut both of them hard back into the old wood last year with a view to stimulating their vigour; it is already apparent that the operation has had the desired effect. Another specimen of *Q. rubra Schrefeldii*, which I am informed was also obtained from Germany, is to be seen growing at Kew. I should mention here that I have a *rubra* hybrid 8 ft. high, and growing vigorously, in which case the pollen parent has not been identified, *Q. rubra* × ?

Q. × Sargentii.—This is a hybrid, *pedunculata* × *Prinus*, 1 ft. 3 in. high, and was doubtless given me about 1913 by my friend the professor, whose name it bears, and it is still too young to enable me to give any satisfactory account of it.

Q. Schneckii (Britton).—Those who have not been set the task of ordering and maintaining a large botanical collection of trees and shrubs would hardly realize how difficult a matter it is, even though the greatest pains be taken to see that plants gathered from all quarters of the globe are true to the names borne by them, and that such names are all in accord with one system, in my case naturally the one adopted by Kew. "Tell it not in Gath, publish it not in the streets of Askelon," but I have in the past, even there in the Mecca of botanists, detected cases of two trees of the same species bearing diverse names, as well as an instance of the converse error. In my own case it was only as late as last year that I had to remove from a specimen of this oak a label which bore the more pleasing, and, since it shows the habitat, the more useful appellation of *texana*, in favour of the cacophonous

Schneckii, because, though the former is the name under which this oak came to me from Professor SARGENT, the latter is according to the gospel of Kew.* Dr. HENRY remarks in "Trees and Shrubs," p. 1252, that this species "is not likely to succeed in England," where it cannot enjoy the very hot summers of its home in the Mississippi basin. I am well aware that "one swallow does not make summer"—a true saying, which is certainly older than ARISTOTLE—but judging merely from the behaviour of my three specimens at Aldenham, where they have been growing over sixteen years, they seem to do very nearly as well as the commoner red and scarlet oaks, and two of them are now over 15 ft. high, with a girth of 10 in. at 3 ft. above ground, and the third is 11 ft. in height. I fully agree with another remark of Dr. HENRY, that without examination of the acorns few would detect any difference between this and the Pin Oak, *Q. palustris*. It is a well-looking tree enough, but is not sufficiently distinct to justify a declaration, in the advertising style, that no gentleman's country-seat should be without it. Truth to say, there are a good many oaks besides *Schneckii* of which the special characteristics do not, as the French say, jump to the eyes, and there are some which no one could name with certainty without examining flowers and fruit. Though no one, who had made any study of oaks and was not purblind, could fail to recognize *Q. marylandica* at a glance, yet plenty of people might confuse *coccinea* and *palustris*, or in the ever-green section, though with less excuse, *glabra* and *acuta*.

Leaves under cultivation vary extraordinarily and prove but treacherous guides. I can recall a Chinese vine from which I have gathered from one branch entire leaves, and leaves with three, four, and five lobes. I know that some of my correspondents look on me as a rank impostor because I have failed to identify a plant, of which only one leaf was exhibited, and I have heard real experts condemned in the same way and quite as unreasonably. The difficulty of identification is greatly intensified in the case of oaks, by the fact that many of the exotics bear fruit very sparsely away from their native land, and some do not do so at all, or at any rate not till they have attained a greater age than they have yet been able to do in this country.

Q. semecarpifolia (Smith).—This sub-evergreen Himalayan oak has not only the advantage of being the hardiest member of the genus which comes from that quarter, but also of bearing the finest foliage of any oak known to me, with the doubtful exception of *Q. marylandica*. It is exceedingly rare in European cultivation, and the only one with which I am acquainted besides the two trees raised by Mr. GAMBLE, and now flourishing in his Hampshire home at East Liss, being about fifteen years old, and 19 ft. with a girth of 17 in. and 13 ft. $\times$ 10½ in. respectively (JOURNAL R.H.S. vol. xl, p. 78), is

* I have recently been informed that Professor SARGENT was in error in giving the name *texana* to this oak, and that the true original *Q. texana* of Buckley is a different tree.

that at Tregrehan in Cornwall, which in 1916 was from 15 to 16 ft. high.

The name *semecarpifolia* was devised by Sir J. E. SMITH, who would have done better if he had called it *semecarpiphylla* and used a name composed of three Greek words instead of one made up of two Greek and one Latin. *Semecarpus*, which I take it means "with remarkable fruit," is a generic name in the order Anacardiaceae, and the suggestion is that the leaves of this oak recall the *Semecarpus*; how far that may be so I know not, for no *Semecarpus* has ever come my way. Anyhow, the leaves of this oak are "a sight for sore eyes," being large, of fleshy texture, with a corrugated surface, a rich dark green colour on the upper side, the under being adorned by an orange-buff down; they are usually rounded at the apex, and in mature trees the margins are wavy, but in young ones spiny; they are broad for their length, being usually about 3 in. long by 2 in. broad.

Q. serrata (Thunberg).—This deciduous oak is said to have been first introduced into England from Japan in 1862, but it is still quite a rarity in European cultivation, and fruit of it was collected by WILSON in one of his Chinese expeditions, and the best of my two specimens, now 10 ft. high, is doubtless from that country, and one of the many botanical results of that explorer's zeal and capacity.

The tree is described in ELWES' "Trees of Great Britain," in BEAN'S "Trees and Shrubs," as also in "Plantae Wilsonianae," vol. iii. pp. 217-9, where it is stated to be a common low-level oak of the Yangtze Valley, making "a handsome tree 25 mètres tall, with stout widespreading branches." I have never had the good fortune to look at a specimen which was anywhere near approaching maturity, though I might have seen a good tree in VEITCH'S nursery garden at Coombe Wood, and Mr. ELWES records one 40 ft. high at Beauport, Sussex. A distinguishing feature in the leaves of this oak, which are long, very narrow, and sharply lobed, is that the lateral nerves terminate in bristles along the edges.

Q. sessiliflora (Salisbury), Durmast Oak.—This oak, though common enough in the North, is not, I think, so usually seen in the South of England, and there are certainly none in our neighbourhood except young trees introduced by myself, and which are not yet important enough to deserve any notice.

In "Trees of Great Britain" Mr. ELWES states that it is usually found on the poorer soils which have never been touched by the plough, and gives the Wyre Forest, the Forest of Dean, and the district about Burnham Beeches as places in the South of England where it is the prevailing tree. He records as many as fifteen named varieties of this oak. We have but some seven or eight, of which the only one with foliage of abnormal coloration is *Q. sessiliflora rubicunda*, where the leaves old and young are of a light thin pale-red shade. Of my two specimens one is ill-shaped, and though it has been sixteen years on its present site has never got well hold of the ground and is not now 8 ft. high; this, however, may be no indication of the way in which

another plant of the same variety might behave—indeed, my second plant has done better and has reached 9 ft. 6 in. Of those with quaintly shaped leaves there are two trees of *Q. sessiliflora laciniata crispa*, of which the taller is 18 ft. high with a girth of 9 in.; it is shapely and vigorous and looks like making a fine tree, the leaves are very curious, growing in great bunches or conglomerations, some of them being quite normal, while others are converted into long narrow ribands 7 or 8 in. long and less than half an inch in width. The plant so far shows no sign of reverting in any part to type, nor does the proportion of riband-like leaves seem to lessen. We have also two specimens of another variety, *Q. sessiliflora Louettii*, which are 18 ft. × 11 in. and 16 ft. × 11 in. respectively; this is described in BEAN'S book under a synonym, *Q. sessiliflora mespilifolia*; it is also a striking form, with long narrow leaves tapering at both ends. We have, too, two *Q. sessiliflora Giesleri*, which are 22 ft. high with a girth of 1 ft. 5 in., and 17 ft. with a girth of 1 ft. respectively; these have grown particularly freely and well, and like *Q. sessiliflora laciniata* have some leaves normal and some unnaturally lengthened and narrowed, but the eccentricity of form is not so marked in this case. Besides these there is *Q. sessiliflora longifolia*, 18 ft. × 1 ft. 6 in., and *Q. sessiliflora longifolia hybrida*, 14 ft. 6 in. × 1 ft. 7 in.; both these varieties have all their leaves converted into ribands, but what the justification may be for calling the latter a hybrid I am unable to say. Over and above these named varieties we have two seedlings which are the progeny of an unnamed tree in the arboretum at Tortworth, and belong apparently to this species. The leaves are quite exceptionally large, being fully 5 in. long, and varying greatly in width from $\frac{1}{4}$ of an inch at the base to $2\frac{1}{2}$ in. at the broadest, just below where they begin to narrow to form the apex. They are also very deeply and very irregularly lobed, in some cases being cut away to within $\frac{1}{8}$ of an inch of the midrib. The effect produced is noticeably distinct from that of a normal *Q. sessiliflora*, and the tree deserves a varietal name much more than many which I have seen thus distinguished.

I have also to record a striking-looking variety, *Q. sessilifolia Hentzii*. When I bought it from a Continental nursery it bore the name *Q. Cerris Hentzii*, but when it fruited it became clear that this was a misnomer; it is now over 15 ft. high, and girths more than a foot at 3 ft. above ground. The leaves are short, of a greyish tone, and wavy or crumpled in form, being very woolly on the under side.

At one time our catalogue shows we had yet another variety, *Q. sessiliflora laciniata*, but as to this I can only make the announcement which we have so often seen during the last few years concerning our gallant soldiers—"Missing, believed to be dead."

Q. Suber (Linnaeus).—Though I look on the cork oak as so tender that I have almost given up hope of succeeding in establishing it at Aldenham, yet as "hope springs eternal in the human breast," and having recently had some young plants given me by Lord PHILLIMORE,

I mean to try them again in sheltered positions. Much to my surprise, Professor BALFOUR informs me that it has proved hardy for many years at Edinburgh, but one is constantly coming across cases of tender plants thriving in unexpected places—e.g. I have seen *Embothrium coccineum* growing quite comfortably on the Cotswolds at my friend Sir GEORGE HOLFORD's; and the only explanation which I can suggest is that when a plant has a soil that exactly suits it, it can then contend with climatic conditions under which in ordinary circumstances it would succumb. It is said to have been introduced as early as 1699, and even if this statement be not true, it only antedates its arrival by a few years. The south-west of England is the part where it is to be seen at its best, and Sir ROBERT NEWMAN's trees at Mamhead, near Exeter, have long been famous. For the last five or six years, however, we have had a plant of the attractive neat-growing, small-leaved variety, *Q. Suber occidentalis*, which though quite small passed unscathed through the cruel winter of 1916-17. I mention its being "quite small," for, as all cultivators are aware, a well-established and rooted plant some 25 ft. high, with its terminal lead well above the frost level, will often escape injury when a newly planted one of the same species, still in the nursery stage, will be crippled or killed. A striking example of the truth of this dictum occurred at Aldenham in the above-named winter in the case of our *Nothofagus obliqua*. Mr. ELWES bears out my estimate of the two forms of *Suber* by mentioning that at Nancy this variety is hardy in ordinary winters, though the type always succumbs there in the first winter after planting. The most probable explanation of the variety being so much hardier than the type is that it has naturally a more northern habitat, namely, Portugal and the Atlantic region, whereas the home of the type is along the Mediterranean.

I owe the presence of my plant, which is now 5 ft. high and of good promise, like so many others, to the generosity of my eminent friend, the Director of Kew. A marked feature of this deciduous tree is that it holds its leaves all through winter, not shedding them till June, when they are pushed off by the newly growing ones.

Q. Toza (Bosc), Pyrenean Oak.—This is one of the most free-growing, distinct, and pleasing oaks that I know; the grey down which covers the young shoots gives the tree a glaucous appearance and makes it contrast very effectively with any conifers in its neighbourhood, and the depth to which the largest leaves are lobed helps to add distinction to the plant. All four of my specimens are growing well, the youngest is labelled simply *Toza* and is only 6 ft. high. Two plants called *Q. Toza pendula* are some twenty years old, or a little more, and are 18 ft. high with a girth of over a foot. Though given this varietal name by the nurseryman who raised them, they do not, I consider, deserve this distinction, for it is a recognized habit of this species to produce long, slender, and consequently pendulous branches under cultivation. In my judgment the epithet *pendula* should only be applied to forms such as those of some ashes, elms, and

of the pedunculate oak, where a "weeping" character is assumed quite different from the type.

My best plant of this species is labelled *Q. Toza Velanii*, and measures 23 ft. in height by 1 ft. 6 in. in girth; it is quite a fine tree. I can find no such variety described in the books, and am not botanist enough to say how far it diverges from the type beyond the fact that in this case the branches are not the least pendulous. BEAN mentions the special liability of *Q. Toza* to suffer from autumn gales, but though both *Q. imbricaria* and *Q. Phellos* have been severely injured from this cause, so far my *Q. Toza* have escaped. Though widely spread in Spain and Portugal, it does not seem to have been brought to England until the early part of the nineteenth century, and never seems to have "caught on" or become common in gardens. In spite of its Southern habitat, it seems perfectly hardy even in the colder parts of this country. I have also two hybrids, *Q. Toza* $\times$ *macrocarpa*, in the nursery, 3 and 2 ft. high, and *Q. Toza* $\times$ *Robur*, of which the tallest plants are 3 ft. high and 7 ft. 6 in. high respectively.

It is a great pity that people should go on using the out-of-date name *Robur* to describe a specific form of oak. LINNÆUS, I think, used it to cover *pedunculata*, *sessiliflora*, and *lanuginosa*—which of the three was the father of my oak it would take a far better botanist than I am to decide by looking at it, but the chances are much in favour of its having been the first of the three. This oak seems to lend itself very readily to pollination by other species, the well-known tree at Tortworth, *Q. Toza* $\times$ *pedunculata*, being a case in point. Besides the above I have a fine free-growing tree 33 ft. in height and 2 ft. 1 in. in girth which has always been called *Q. lanuginosa*, or one of its synonyms; this year, however, the experts have pronounced it to be *Toza*, or *Toza* $\times$ *lanuginosa*. It is so unlike any *Toza* that I have ever seen, though nearer to our *Q. Toza Velanii* than to any other, that I regard the latter view as more likely to be correct. One reason which makes me think it unlikely to be pure *Toza* is, that whereas that species comes into leaf along with the other oaks, this, though very vigorous, is quite the last, and on June 1 of this year no buds had opened. Although this may be a disadvantage from the ornamental standpoint, at least it ensures its escape from one of the greatest drawbacks to the acclimatization of exotics, namely, late spring frosts.

When the leaves, which are usually over 3 in. long, do at length appear, their under side is covered with a grey down or tomentum, which produces a glaucous effect and contrasts pleasingly with the green in the landscape.

Q. x Turneri (Willdenow).—I have two good-sized specimens of this hybrid between *Q. Ilex* and *Q. pedunculata*; in the case of one the pruning-knife has, alas, been neglected. It has been allowed to grow into a big bush instead of being compelled to assume a tree form, and it is now too late to remedy the fault. In the case of the other, although it would have been taller and better-proportioned if some stout boughs had been removed near the base at an earlier

period of its career, yet it has a single stem and a good leader, so should in time make a satisfactory tree. Its height is 17 ft. and girth 3 ft. above ground 1 ft. 2 in. (fig. 26).

I am afraid I must dissent from the remark of Mr. ELWES in "Trees of Great Britain" that this hybrid has nothing to recommend it from an ornamental standpoint, and that it is in all respects inferior to a Lucombe. The leaves of my plant are quite evergreen, over 4 in. long and of a rich bright green, and have shallow irregular lobes. I know that the foliage of *Q. × Lucombeana* varies enormously both in shape and in deciduous or evergreen character, and when one sees a plant which is apparently almost pure *Cerris*, and another which might be a true *Q. Suber*, it is very difficult to believe that both have the same parentage. Although at various times I have seen Lucombes extraordinarily diverse, I have yet to come across one with foliage as fine as my *Q. × Turneri*. Both my plants would be classed by some botanists as a variety of the type, namely, *Q. × Turneri pseudo-Turneri*, but since, as pointed out by Mr. BEAN, there is a tree growing at Kew which bears both the typical leaves, and those which characterize the variety, I am inclined to agree with him that it is not desirable to draw any distinction between the two forms. Moreover, the name *pseudo-Turneri* seems to me peculiarly ill-chosen.

It is well to speak of a maple as *Pseudo-platanus* and of a robinia as *Pseudacacia*, for in both those instances the leaves of the particular tree simulate those of another which belongs to a totally distinct botanical order, accordingly that is a judicious use of the Greek word for 'false'; on the other hand, to call a form of Turner's oak which happens to have unusually long leaves *Q. Turneri pseudo-Turneri* is to employ a contradiction in terms, and to say in one breath that an oak is, and is not, Turner's. These criticisms do not apply to the name *Q. pseudo-Suber*, for whether or not that tree be a hybrid it is not the true unadulterated *Q. Suber*.

Q. utahensis (Rydberg).—This deciduous oak is quite a recent introduction to England, and was first received at Kew as late as 1912. I have a healthy little plant 2 ft. 6 in. high, which was kindly sent me last year from that institution. It is a native of the mountains of Utah, Colorado, Arizona, and New Mexico, at an elevation of 4000 to 9000 ft. It is quite a small tree, not attaining to a height of more than 10 metres.

The leaves are broadly obovate, 6 to 10. cm. long, with 7 to 9 oblong to obovate lobes; they are rounded at the apex, where they are seldom lobed; there are deep spaces (sinuses) of varying size between the lobes. The texture of the foliage is thick and firm and the colour dark green; the upper side is shiny and slightly hairy, while the under side is almost velvety, paler in colour, and showing prominent venation. The ovoid-oblong acorns 1.5 to 2 cm. long are nearly sessile, and ripen in one season; they are set about half-way in the cups, which are covered with ovate, corky, thickened hairy scales. The above is founded on information with which the Director



FIG. 25. -*QUERCUS PHellos*

(V. juv. p. 118.)



FIG. 26. *QUERCUS TURNERI*.

of Kew has favoured me, and is based on the account given in BRITTON and SCHAFER'S "North American Trees," p. 339.

This oak was first described under the name of *Q. stellata ulahensis*, and in SARGENT'S "Silva," vol. viii. p. 33, this is treated as being a synonym of *Q. Gambelii*. More recently RYDBERG, a very competent critic of North American plants, in his "Flora of Colorado," p. 98 (1906), regards the two as distinct, and accords the oak now under discussion specific rank as *Q. ulahensis*. Undoubtedly it and *Q. Gambelii* are very close, but according to RYDBERG the former is a small tree with leaves which are velvety beneath, while the latter is a shrub whose leaves do not show this characteristic. As stated earlier in this article *sub Q. Gambelii* I also possess that species, and an unhealthy plant which I received under the name of *Q. stellata*.

Q. variabilis (Blüme).—This deciduous Chinese oak, which grows also in Korea, was first introduced into England in 1861 from the neighbourhood of Pekin, but it was also collected by WILSON in Western China about 1906, and my plants come from that source, the kind intermediary to whom I am indebted for them being Professor SARGENT. The tree is closely allied to another Chinese species, *Q. serrata*, and is considered by some botanists to be merely a variety of that species. BEAN considers that its foliage is inferior to the latter in brightness. I have not observed this inferiority—indeed, I consider that the silvery grey under side of its long, narrow, oval leaves, a feature not present either in *Q. serrata* or in *Q. glandulifera*, to which its leaves also have a likeness, gives it the pre-eminence.

The best plants now known to exist in England date from 1882. The Aldenham specimens, though quite healthy, have hardly got out of the nursery, and the tallest measures only 8 ft. in height. Accounts of this tree are to be found both in "Trees of Great Britain and Ireland," p. 1276, and in "Plantae Wilsonianae," vol. iii. pp. 219-220. I have also two oaks, 3 ft. and 4 ft. high, labelled "sp. from Pekin Legation," which may, I think, safely be allotted to this species.

Q. velutina (Lamarck), Black Oak.—I have no good-sized specimen of this, the two tallest being only 14 and 13 ft. high respectively, with a girth in each case of 9 in., but all alike look clean-grown, healthy, and promising. It is one of the commonest and most widely spread of the genus in its natural habitat, North America, but for some reason is far seldomer to be found than *Q. rubra*, to which it has a decided surface resemblance, though it seems to me more rigid and less weedy in growth. Internally it can be distinguished by the yellow colour of the inner bark, from which and from the acorns a dye of commercial value is extracted. The leaves of this species are sometimes of immense size, but unluckily I cannot claim the possession of this striking feature for my examples. There is a variety of this kind at Kew with the biggest leaves I have ever seen on an oak; they are fully a foot long by 8 in. at the broadest, and have immense lobes; owing doubtless to their length, these leaves hang downwards, which makes the effect even more striking than it would otherwise be.

The name *velutina* has also been selected by some botanists for a Chinese oak of very different appearance and much greater rarity, *Q. vestita*, which is described in "Plantae Wilsonianae," vol. iii. p. 236.

Q. Vibrayeana (Franchet et Savatier) is a very attractive evergreen, so little like the ordinary conception of an oak that it is very difficult for the unlearned to accept without scepticism the assurance that it belongs to that order. It makes a small tree in its own country, Japan, but is not common even there: here I should doubt its being even more than a fine shrub, and certainly that is the case with both my plants. The finer of the two was bought some five-and-twenty years ago from the Yokohama Nursery Co. and is now a large well-proportioned bush, 9 ft. high by 8 ft. across. It may be worth mention that a few years ago nearly a quarter of the plant took on a sickly and bilious yellow aspect, making me fear that it would become a wreck; this was entirely cured by the simple expedient of giving the roots a free dressing with soot, which had the effect of promptly restoring this rarity to perfect health and beauty. I know nothing of the kind prettier than the summer growth of young shoots on this oak, though the colour of the elegant, fine-pointed, lanceolate little leaves is hard to convey in writing, being a mixture of chocolate, purple, grey, and olive, which contrasts admirably with the dark green leathery older foliage. So far my plant has never borne acorns. It has, I am glad to say, proved absolutely hardy, and even the 33° of frost of February 1919 had no more effect on it than they had on *Q. acuta* and *Q. phillyracoides*. For other evergreen oaks which proved less able to resist such cold, see remarks under the latter heading.

It is very annoying that, in spite of botanical congresses and the dictates of convenience and common sense, there should still be no uniformity in the nomenclature adopted by English and American botanists. I had hardly yet got accustomed to talking of this oak as *Vibrayeana*, having so long known it as *Q. acuta* var. *bambusifolia*, when on taking up "Plantae Wilsonianae," to study the account of the Chinese oaks, I found this one figuring under the, to me, entirely new name of *Q. myrsinæfolia*. How long this may last, whether it may be adopted by Kew, or what new christening process may take place before these lines are in print, I have no idea. There can, however, be no doubt that these constant name changes are extraordinarily confusing and irritating, and I devoutly wish that learned pundits would weigh the advice usually offered by Lord MELBOURNE, when alterations were canvassed, "Why can't you let it alone?"

It is not merely the changing of names which gives cause for complaint, but also the frightful grammatical blunders and false concords which disfigure botanical nomenclature. I suppose it would be unreasonable to expect from the namers an elementary knowledge of Greek and Latin before making use of those languages, but one would think they might submit their name coinage to some school

teacher or schoolboy for correction before putting it into circulation, when, as it is a case of "forced currency," we all have to use it. These mistakes by no means exclusively belong to "unhappy far-off days," like the terrible *Liriodendron tulipifera* and *Cotoneaster frigida*. It is a great pity to spread errors of grammar, and if a knowledge of Latin and Greek does not repay (as many now consider) the labour and time requisite for its acquisition, those who have acted on this assumption had better not employ those languages. No possible confusion could arise from writing *Liriodendron tulipiferum* and *Cotoneaster frigidus*, and it would be well in future to assign the proper gender to all trees. Strangely enough, it has leaked out among botanists that *Acer* is neuter, and in that case the correct gender is always given. But enough of this grumbling, let me revert to the pleasanter subject of oaks, though when one has reached V the tale is almost told.

Quercus Virginiana.—Just as this article is going to press, and too late for me to give any account of it (see p. 178, where it is incidentally mentioned), I have received from my kind friends in the Department of Agriculture at Washington two plants of this American "live" oak. I do not remember to have seen a specimen at Kew, and it is, I believe, very rarely met with anywhere else in Europe.

Q. Wislizenii (A. de Candolle).—This evergreen oak is commonly to be found almost throughout California, along the lower slopes of the Sierra Nevada, as a stately tree reaching a maximum height of 75 ft. It is admirably figured on Plates 3 and 4 of "West American Oaks" by EDWARD L. GREENE, the drawings being by the American botanist KELLOGG, published 1889. Dr. HENRY, in "Trees of Great Britain," speaks of one at Kew, and adds, "We have seen no specimens elsewhere." Had he written about 1916 or 1917 instead of 1910, he might, if he had thought it worth while, have recorded the existence of a small one at Aldenham, which I owe to the kindness of my friend F. R. S. BALFOUR, of Dawyck. It is not as yet particularly vigorous, and even if it should survive for a number of years, I very much doubt its ever making more than a shrub in Hertfordshire; probably, like the majority of the Californian flora, it would be more at home in the West of England.

The bark of this tree is black and rough; the lanceolate or oval leaves are dark and shiny, averaging about 2 in. in length, and on stout stalks or petioles; the acorns, which are to be found both sessile and peduncled, are quite exceptionally long, narrow, and pointed, with marked longitudinal lines or grooves, and take two seasons to mature; the wood is hard and lasting, and valuable for mechanical purposes. It is allied to and resembles, in its bark, acorns, and holly-like leaves, *Q. agrifolia*, but, unlike that species, avoids the sea-coast, and consequently was a later introduction to Europe, which it first appears to have reached in or about 1870. As far as foliage is concerned, it is also very like the distant Levantine *Q. coccifera*, but the fruit is wholly different.

Considering how recent are the works on oaks of Messrs. ELWES, HENRY, and BEAN, to which I must admit a heavy debt, it must seem rather otiose and unnecessary for me to have written again on the same subject. There must always, however, be some interest in an account of any particular collection, and in this case it is increased by the fact that many of the specimens which I have endeavoured to describe have been written of ten years before by Mr. ELWES. Any value that this paper can have must arise from the extent to which it gives at first hand my own experience; accordingly I hope that the keenness of my interest in the subject may to some extent countervail my botanical incompetence to deal with it.

When I started to write this paper I meant to confine it exclusively to oaks actually growing at Aldenham, but as I went on I found that there were so few hardy ones, such as *cinerea*, *glauca*, *lyrata*, *obtusata*, &c., which though described by English writers on trees, and growing elsewhere in England, are yet unrepresented at Aldenham, that I thought it better to make the paper more complete by adding a short account of these also, and I felt the more justified in doing this as I have taken steps to arrange for these missing ones being grafted and added to our collection.

Of course there are tender oaks, such as *Q. crassipes* and *Q. glabrescens* from Mexico, and others from India and the warmer parts of China, which are not only not at Aldenham, but could never grow there for any time, and of these no account is given; all the information would be second hand, and in my opinion, and doubtless that of my readers, if I had any, quite worthless. Neither have I attempted to describe Chinese novelties such as *Q. Baronii*, *Q. spathulata*, &c., which I do not possess, and which are hardly yet, if at all, to be found in European cultivation, but which are dealt with in "Plantae Wilsonianae," vol. iii.

There is, however, another extensive omission with regard to the Western American oaks, for an examination of Professor SARGENT'S "Silva" shows that there are no less than thirteen of them, namely, *Q. Breweri*, *Douglasii*, *dumosa*, *dumosa munita*, *dumosa polycarpa*, *Emoryi*, *Engelmanni*, *hypoleuca*, *reticulata*, *Sadleriana*, *tomentella*, *undulata*, and *undulata grisea*, of which no account will be found. Although it is true that in the past both Kew and Aldenham possessed plants of *Q. Douglasii*, yet to-day, as far as I can learn, not one of these thirteen is in cultivation in England. It does seem strange that when our countrymen should be willing to spend large sums on ransacking Korea and Formosa for new plants, they should have overlooked comparatively accessible trees, which judging from KELLOGG'S drawings of many of them, which I have seen, would form a fine and striking feature in our woods. All the stranger is this neglect when it is remembered that trees from the Pacific coast as a rule thrive well in England.

Other oaks which I have at one time had, but have lost, are *Q. alba* $\times$ *Prinus*, *borealis*, *georgiana*, and *obovata*. I have failed to

find these elsewhere in England, so I can say nothing about them.

I should like to take this opportunity of describing a new and highly successful experiment in oak cultivation which we have made this year, and which may prove useful to others. Like most prudent gardeners we annually collect and stack dead leaves, and we observed in the heap last autumn a self-sown pedunculate oak about 2 ft. high, and three common birches over 3 ft. in height. As this was a surprising growth for about five months from seed, we thought it worth while to try what the effect would be on choicer trees. Accordingly we made a rough bin 4 ft. high, 20 ft. long, and 10 ft. broad, and filled it with dead leaves, giving it a dressing on the top of last year's leaf-mould. At the end of last May we lifted all the small sickly oaks out of the nursery, none of which, if left where they were, gave any prospect of making decent trees, and most of which would probably have soon died, and, after cutting them down within 2 in. of the ground, planted them in the leaves. On July 31 last I made a careful examination of them, and the result exceeded my expectations; quite 95 per cent. had grown vigorously, and to give a few examples, *Q. variabilis* had grown 2 ft., *Q. lusitanica serratifolia* 16 in., *Q. Gilliana*, *Q. cuneata*, and *Q. aliena* 14 in., and many others had sent up clean, straight, healthy shoots of over a foot. Decaying leaves generate a steady moist bottom heat which lasts for fully six months, and stimulates the growth of the trees planted in them in a surprising fashion, so that they can't really help growing if there is any life in them at all. There can be no doubt that if I had made this experiment with tree seeds, instead of with thoroughly unhealthy trees, the result would have been better still, and there is, of course, no reason whatever why the plan should not be exactly as effective with other genera as it has proved with oaks.

Now this long, and I fear in parts tedious tale is done, but it passes the wit of man to make a catalogue very light reading. If any reader should get a tithe of the satisfaction out of reading that I have had in preparing this paper, I shall feel more than repaid for the labour.

COB-NUTS AND FILBERTS.

By E. A. BUNYARD, F.L.S.

[Read Sept. 24, 1918; Mr. W. H. DIVERS, V.M.H., in the Chair.]

THE distribution of *Corylus Avellana* extends over Europe, North Africa, to Central and Russian Asia, and it has been a food-plant from the early days of man. Some botanists have recognized three species, viz.: *Corylus Avellana*, *C. tubulus*, and *C. barcelona*, which correspond to our Cob-Nuts, Filberts, and Spanish Nuts. Whatever rank we may give to these divisions it is certain that they have been long recognized: as THEOPHRASTUS knew two sorts, "some having a round, others an oblong, nut." These are the Heracleatic Nuts, so called from Heraclea, now Ponderachi, on the Black Sea, from whence they were supposed to have been introduced.

To HIPPOCRATES they were known as *Carya thusia*; and in PLINY we first find the specific name, *Avellana*, from Abellana in Asia, whence they were introduced. Some coming from Pontus were also called Pontic Nuts.

Abellana in Italy has presumably taken its name from the Asiatic town, and it is still a nut-growing centre.

So widespread a fruit has naturally been surrounded by an ancient lore; and the nut as an emblem of fruitfulness in marriage ceremonies, and in more northern climes as a lightning-plant, a charm against witches, and as a tree sacred to THOR, figures largely in European Mythology. Even to-day the magical properties of its twigs as water-finders are maintained.

It is not possible to glean much of its past history from its different names in various countries. The Germanic nations have the word Hazel; Old English, Hæsel; Dutch, Hazel; German, Hasel. The Latin nations have Aveline, from Abellana. A modern German name, "Lambertsnuß," has been variously explained as Langbart, long beard—referring supposedly to the long husk of the Filbert. According to KOCH, the name is derived from the Longobards or Lombards. It is quite possible that they may have introduced a fine variety from Eastern Europe in their westward migration. The Lambertsnuß is still a recognized class in Germany, and it is a curious coincidence that our best-known British Nut, the Kent Cob, should have been raised by a Mr. A. LAMBERT, and is still known as 'Lambert's Filbert.'

The origin of the word "Cob," as applied to the short, round nuts which are not covered by the husk, is not dealt with by any of the usual authorities; but it may perhaps be compared with its use for a stout and smaller horse.

Filbert is correctly used for those long nuts which are quite covered by a husk, and has been derived, according to some writers, as in the German case, from "full-beard." It is probably, however, to St. PHILIBERT that we owe the name, as his day falls on August 22, which would correspond with the ripening date, as also with the old spelling of the name.

It is difficult to get an accurate idea of the size of the nuts of the classical writers; and though it cannot be positively asserted, it seems likely that, as in many other fruits, Italy is the country where its development was started. We have, however, good evidence that in the fifteenth century they were of a size little inferior to that of the present day.

In a picture by CRIVELLI, one of the Italian primitives, now at Berlin, there is a garland of fruits, including a bunch of nuts which might almost be our Kent Cob of to-day. As the other fruits shown serve as a basis of comparison it is evident that the succeeding four hundred years have not added much in size.

From the earlier Herbalists we can gain some idea of the varieties cultivated in the seventeenth century. CASPAR BAUHIN, in his "*Pinax*" (1671), describes six varieties, including the White and Red Filberts, a large, round-fruited variety, and the *Avellana major Lugdunensis* or Lyons nut, evidently a prototype of the large Cobs of the present day.

These six varieties formed for many years the only ones described by horticultural writers, and it is not till comparatively recent times that even seedlings were raised.

In Germany the Pastor HENNE, in the middle of last century, raised the 'Gunslebener Filbert,' which later proved of importance as the parent of the giant variety, 'Hallesche Giant' (fig. 30)—a variety which, however, is too poor a cropper in this country to be of any value. BURCHARDT, an able German pomologist of about the same period, did much work in collecting the best varieties of nuts and published one of the earliest treatises on this fruit entitled "Contributions to the History of the Hazel Nut."

In France little or nothing was done in the way of raising new varieties, and in England the few sorts named by BAUHIN seem to have been the only ones available for a long period.

In Brookshaw's "*Pomona Britannica*," published in 1812, we find eight varieties figured, which he expressly states are all that he has ever met with. These include the Filberts White and Red, the Barcelona, a large nut resembling our present Kent Cob and unlike the Barcelona of the shops of to-day, the English Cob, resembling 'Merveille de Bolwyller,' and a few of unknown origin.

From this time, however, English gardeners seem to have taken a renewed interest in Nuts; and the raising of the 'Cosford' (fig. 27), in 1816, may have stimulated others to raise seedlings.

In the Catalogue of Fruits grown at Chiswick, and published in 1831, there are thirty-one varieties: thirteen of which by their names are probably of British origin.

The greatest work, however, was done by RICHARD WEBB, of Calcot, near Reading; and so important have his seedlings become that everywhere they remain the standard of quality.

RICHARD WEBB was evidently one of those individuals who are called "characters." His walled-in garden contained a monument to alcohol, where he interred, in a moment of temperance, all the choice wines of his cellars. His house was guarded by several bloodhounds, and his nut-trees from depredation by sixty cats. He was apparently an early advocate of a nut-and-fruit diet.

CULTURAL.

The fact that Nut-growing has long been established in Kent has led to the opinion that in this county only can it be profitably undertaken. This, however, is far from being the case, as the wild nut flourishes on very different soils, including cold clays, light sands, thin soils on chalk, and stiff loams. Where the wild plant will grow, nuts can be cultivated; and as a plant for rough, stony banks, on which no other profitable crop can be grown, it may be planted with great confidence, thus bringing into use land which is often wasted. On very rich soils it is apt to grow rather too vigorously and requires much pruning, so that such soils are better reserved for fruits such as Apples, Pears, Plums, Black Currants, and Gooseberries.

Another advantage the nut possesses is that of supporting a considerable amount of shade, and it is largely planted under standard trees in Kentish orchards.

There are many shady corners in shrubberies which might be made profitable by planting Nuts; and if manuring is not forgotten they will bear well. For commercial and garden use the bush form is undoubtedly best, except for the special purposes mentioned below. The open-cup form has been adopted in Kent for many years.

All trees must be propagated by layering, which consists of bedding down young shoots so that they root in the ground, and when rooted severing them from the parent plant. Seedlings will not come true to type, and should be rigorously avoided.

The young plants make good roots in one year, and are then planted out and cut back so as to make a stem of twelve to eighteen inches. From the top of the shoot several strong growths will emerge, and these will form the main permanent branches of the tree. If there are six good shoots, these will be enough to frame the tree with; if less, they should be cut back and others made to divaricate and make up the required number. As in pruning other fruit-trees, the weaker the growth the shorter must be the pruning; good, strong main branches are the first consideration, and these cannot be produced by weakly shoots. When the main shoots are formed, the pruning will consist of such shortening as to make them throw out their side-buds into short "spray," on which the flowers will be produced.

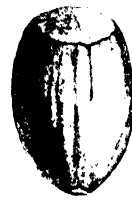


FIG. 27.—COSFORD.

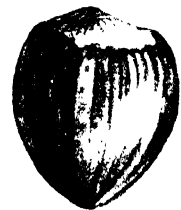


FIG. 28.—DUKE OF EDINBURGH.



FIG. 29. - GARIBALDI.



FIG. 30. - GÉANT DE HALLE.



FIG. 31. WEEB'S PRIZE COR.



FIG. 32.—FRIZZLED FILBERT.



FIG. 33.—PEARSON'S PROLIFIC.

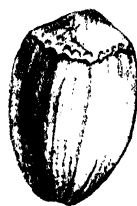


FIG. 34.—KENT COB.

[To face page 227.]

No exact formula for the treatment of the main branches can be given, as the vigour of the tree is the determining factor; but it will generally be necessary to prune them to about half their length. Thus each year the branch is advanced outward and upward, considering it as a cordon until the desired height is reached, and about six feet is usually considered enough.

This restrictive method is necessary to produce the largest nuts; but it is quite possible to let them grow naturally, as the Wild Hazel in the woods, merely thinning out a branch here and there where they are crowded. The nuts produced will be smaller, but not so small as might be expected—the difference really being in the length of the husk. A comparison of the nuts of such trees which have grown “wild” and those from severely pruned trees will show this point.

We have, so far, considered the tree as a group of radiating cordons; but there is one other point of importance, and that is the strong “wands,” or shoots, which will spring up from the centre, as evidence of the tree’s wish to grow up in the natural manner. These shoots must be removed in winter, and are broken out by a sharp twist and not cut with a knife, which is apt to make them shoot again yet more strongly; the damage done to the basal buds by the rending of the wand prevents them from growing up again.

The tree, when a few years old, will begin to throw up shoots from the roots—“spawn,” as it is technically termed—and these must be cut out by digging down to the root and cutting off close to it with a sharp knife. If allowed to remain, a thicket will result, which will compete with the parent tree, and in due time rob it of its nourishment and light.

When the tree has reached its final shape it will not require much pruning save the breaking out of wands and the removal of any large growths.

The flowers of nuts are produced on the short, slender “spray” wood, and it is well therefore for beginners to wait until January or February, when catkins are expanded and the female flowers showing as small claret-coloured threads protruding from the buds. This gives an easy indication as to which growths should be left.

The fertility of nuts depends firstly, of course, on the age and health of the tree, and secondly on the presence of fine and dry weather during the flowering season. Dry frosty weather does no harm, but a constant succession of wet days is a potent cause of crop failure.

A heavy crop in the preceding year does not seem to affect the chances of next season’s, as in many other fruits. The crop of 1917 was good, but was followed by an even larger crop in 1918. No work has yet been done to test the self-sterility or otherwise of Nuts, but, judging from large orchards, one would assume that the commonly grown varieties are quite self-fertile. The common Filbert is notoriously a poor cropper; but this may be due first to its small catkin production and to the fact that in many years its flowers expand before the catkins are shedding their pollen. To remedy this, a

variety which expands its catkins early should be interplanted, and I recommend 'La Bergeri.'

For manure, experience has shown that slow-acting organic manures are undoubtedly to be preferred. Shoddy, the waste from woollen mills, fur-waste, feathers, rape-dust, are used largely by Kentish growers, and on soils where lime is absent basic slag would be advisable. Stable manure, or any nitrogenous manure which produces growth, should be avoided where the tree is growing well.

A few words as to the commercial aspect of Nut culture will not be out of place.

The bushes are planted when three or four years old, usually about 15 feet apart; for varieties like the Kent Cob, 20 feet would be better.

Though Nuts often fruit a little in the nursery rows they cannot be expected to bear much before six years, when a crop of four pounds from a tree may be expected.

This may seem a drawback to planters; but it must be borne in mind that the tree will last for over a hundred years, and may be planted on soils which are not suitable for other crops.

The average yield from an acre, when established, will be about 10 cwts.; but in many years this will be greatly exceeded as, for instance, in 1918, when many plantations produced two tons to the acre. However, like other fruits, they will now and again miss a year, so the average given above is a safe one to take.

The wholesale prices used to average from 4d. to 6d. a pound, but in the last few years this price has been doubled. The home market is, of course, the main outlet, but there is some export trade done, as many exiled Britishers wish to buy this distinctly English fruit. Most of the purchasing for export is done in November and early December, which often causes the prices to rise; while after this trade is over it falls slightly. That more could be done in this, there is little doubt; and in so easily handled a fruit the usual difficulties of transport do not present themselves.

The only by-product of this culture is the wands, which are used for several purposes. Baskets for coal-miners are made from them, as also for other uses; and the grower finds them useful for "splints"—the small pieces of wood which are sprung crosswise on the top of baskets of apples, &c., to keep down the paper or hay with which they are covered. The smaller tips are useful for staking small pot-plants.

Gathering and storing do not present any special difficulties. It is necessary first of all to lay out the nuts to dry thoroughly, or they are apt to mildew if gathered a little wet. When once dry, they must be kept as close as possible, to prevent the nut from shrivelling. For home use it is usual to put them in a crock and cover with a layer of salt or sand.

They can also be stored in small quantities by placing in a drain-pipe in a cool cellar and covering with a slate. By these methods they will be fresh and milky up to March and later.

So far, I have dealt mainly with culture on the larger scale: it remains now to suggest a few methods for the owners of gardens.

Perhaps one of the most attractive ways of growing nuts partly for ornamental purposes is to make a pergola nut-walk. For this purpose small cordon-like trees are used, and they can easily be trained over the supports, and will form a walk no less shady than the pleached alleys of Lime or Elm, and produce a useful crop. They have also the advantage of taking but little of the garden space, as their roots will run under the path.

A row of cordons can be planted upright, as are Pears and other fruits; and small standard-trees are pretty and serve to break the line of the vegetable borders.

I have spoken previously of their value in shady corners, and there are usually many such positions in gardens which can thus profitably be utilized.

DISEASES.

Nuts are, happily, not subject to many serious diseases—in fact, among fruit-trees, they suffer less from pests than any other.

The most common and injurious is probably the Nut Weevil (*Balaninus nucus* Linn.). Its presence is made known by a small circular hole in the shell, and on opening, the small grub will be found to have devoured the nut and to have escaped by the small hole it has eaten out of the shell.

The eggs are laid in June by the mature insect, which is a small weevil, and at this time it may be captured by jarring off on to sheets. Spraying with Katakilla is quite effective for other weevils and will probably be so for this species. As the grub pupates in the soil, frequent cultivation and the presence of fowls under the trees will probably also aid in clearing them from the soil. Arsenic spraying is said also to be quite effective.

Next in order of importance must be placed the Nut-bud Mite (*Eriophyes avellanae* Nalepa), which causes the buds to swell in the same way as does its near relation in the Black Currant. There is, however, no danger of the Currant-bud Mite infesting the Nut, or vice versa.

No remedy has been suggested, but a spraying of Soft Soap and Quassia might be tried as the young growth develops, in the hope of catching the mites *en route* to the young buds from the old ones.

Several Lepidoptera—such as the Winter Moth, Mottled Umber, &c.—feed on the foliage, and can easily be dealt with by arsenical spraying or with Katakilla.

These are the principal insect pests. Fungoid attacks are rare, and beyond an occasional visitation of the Hazel-leaf Mildew (*Phyllactina suffulta*), which can be dealt with by any fungicide, there is little trouble in this respect.

Squirrels and mice are not slow in locating ripe nuts, and the

Nuthatch also may cause slight loss; but these are in no way serious, and must be looked upon as the slight tribute we pay to Nature for her largesse.

LITERATURE.

There cannot be said to be much literature on this subject beyond the great Monograph of GOESCHKE. Pomologists have not treated in any detail the culture or varieties of Nuts. The following list gives a few of the more important articles and books on the subject.

"Deutsches Obstkabinet." Ahrenthal, Jena; 1855.—Contains four good coloured plates and descriptions.

GOESCHKE. "Die Haselnuss." Berlin, 1887.—The most important work on the subject. Contains full detailed descriptions and seventy-six plain plates showing leaf, catkin, nut, &c., in natural size. A very careful and exhaustive piece of work.

DOCHNAHL. "Der Sichere Führer in der Obstkunde," vol. iv. 1860.—Short descriptions and synonyms only.

A. S. FULLER. "The Nut Culturist." New York, 1912.—Contains a chapter on Filberts and special reference to Filbert Blight.

A SELECTION OF THE BEST VARIETIES.

BERGERI.

Syn. 'La Bergeri.'

"Les Meilleurs Fruits," p. 256.

Catkins very long, $3\frac{1}{2}$ inches, rather narrow; anthers pale yellow, no brown tinge; open early. Flowers open much after catkins. General effect of catkin a clear green yellow; very pretty.

Growth vigorous, short jointed, downy, with many glandular hairs.

Leaf rather rugose, tip down curved; young leaf only very faintly red.

Husk thickly set with short hairs; much frizzled and cut at end, the lobes often being over $\frac{1}{2}$ inch.

Nut large, square-shouldered, tapering to point. Flavour good. Mid-season.

A very fine fruit deserving to be more widely cultivated.

Origin.—Introduced by JACOB MACKOY of Liège about 1860–70, as 'La Bergeri.'

COSFORD.

Syn. 'Miss Young's Thin Shelled.'

LINDLEY'S "Pomona Britannica," vol. ii. p. 55.

Catkins thin and fairly long, $2\frac{1}{4}$ inches; bright yellow before anthers open; scales faint dark purple. Females out later than catkins. Prolific catkin-producer.

Shoots fairly strong, densely covered with glandular hairs.

Leaf very rugose, round, pale yellow green, waved and often twisted; young tips pinkish red.

Nut oval, smooth; husk rather small, not covering, a little hairy at base; shell very thin. Flavour very sweet and good.

Origin.—Introduced to notice in 1816. As it came from Ipswich it is probable that it is named after the "hundred" of Cosford in Suffolk.

DUKE OF EDINBURGH.

"Journal of Horticulture," 1883, p. 466.

Catkins 3 inches long, moderately thick; anthers light yellow; scales dull brown, sharply pointed. Catkins very plentiful. Females a little later. Flowers and catkins expand later than most.

Growth strong, straight, covered glandular hairs and slight down; young tips faintly red; leaf rather long, held flat, rather pale green.

Nut round, tapering to a point.

Husk drawn closely in to nut in a very distinct manner.

Quite the best for flavour after the Filberts, and as it is a good cropper it can be very highly recommended.

Origin.—Probably one of WEBB'S Seedlings, and introduced by his successor and son-in-law, Mr. T. O. COOPER. It was awarded an **F.C.C.** by the R.H.S. in 1883.

GARIBALDI.

Catkins long, $3\frac{1}{2}$ inches; scales dirty brown, general appearance very dirty; anthers pale yellow.

Flowers out with catkins, flowering rather late.

Husks long, split, a little drawn in with glandular hairs.

Nut large, tapering to point, always showing two or three deep sutures which divide the shell into compartments. Flavour very good.

A very handsome and free-fruited variety.

Origin.—Raised by Mr. RICHARD WEBB of Calcott.

Goeschke's 'Garibaldi' is not correct.

GÉANT DE HALLE.

GOESCHKE, 19.

Catkins very distinct, thin, $2\frac{1}{2}$ inches long; anthers rich yellow, scales claret red, very pretty contrast between this and the yellow anthers when open. Quite distinct. Scales very sharply pointed. Females rather after catkins.

Husk long and broad, covering nut, much cut.

Nut enormous, very broad at top, tapering to point. Flavour fair.

Origin.—Raised by C. G. BUTNER of Halle in 1788.

This is so poor a cropper at Maidstone that it cannot be recommended. However, in France and Germany it is highly thought of, and may do better where a drier climate can be relied on.

KENT COB.

Syn. 'Lambert's Filbert.'

Catkins expand late, 2 inches, short, thick; scales yellowish green, expanding before flowers.

Growth moderately vigorous, slightly downy, with many glandular hairs of varying length.

Leaves held flat, rather dark greyish green; young tips green.

Nut very large and long; husk quite long covering the nut, serrated at the end. Flavour good.

Origin.—Raised by Mr. LAMBERT of Goudhurst, Kent, about 1830. This has become the most widely planted nut of commerce.

MERVEILLE DE BOIWYLLER.

Catkins thin, $2\frac{1}{2}$ inches, scale faintly claret red, fading to dull brown. Females later than Catkins.

Growth vigorous, rather upright, shoots very stout and straight; young tips dark red, densely covered light-red glandular hairs and slight down.

Leaf round, slightly waved at edge.

Husk short, only half covering nut, cut, but not deeply.

Nut square and short; flavour good. Fertile.

This very distinct nut is rightly valued as one of the best for general use. It can always be recognized in winter by its red pointed buds.

PEARSON'S PROLIFIC.

Syn. '(Hogg) Dwarf Prolific,' 'Nottingham Prolific.'

MAUND'S "Botanic Garden," pl. 39.

Wood slightly downy, very few glandular hairs.

Catkin moderately thick, $2\frac{1}{2}$ inches long; anthers very pale yellow; scales very sharply pointed, dirty brown. Catkins very prolific.

Growth dwarf, internodes short.

Leaf pale green, held flat; young tips rather pale green.

Nut round, rather flattened; flavour good.

Husk cut to about half its length, hairy, showing nut; shell downy.

Originated at Newark, Notts, from a seedling nut said to have been brought home by a companion of Major Cartwright on his return from Labrador. Introduced by Messrs. PEARSON & Co. of Chilwell, Notts.

PROLIFIC FILBERT.

Catkin rather thick, $2\frac{1}{2}$ inches long, scale very faint claret red, hardly noticeable when fully out, as it fades to a dirty white. Females out with catkins.

Growth, summer shoots slender, long, densely covered with glandular hairs without down.

Leaf well apart, held nearly flat; in young state claret red.

Nut small, long and pointed, in bunches often up to six and eight, the earliest to ripen.

Husk very much cut and twisted.

This is not the 'Frizzled Filbert' of LINDLEY, and its origin is not yet ascertained.

RED FILBERT.

French 'Aveline Rouge,' 'Franche Rouge.' *Syn.* 'Red-Skinned Filbert.'

Catkins rather long, moderately stout; anthers pale claret red; scale dull brown, not pointed. Catkins latest of all. Flowers out before catkins. Very few catkins.

Growth very distinct, long slender shoots, downy, very rare glandular hairs; young tips dark red brown.

Leaf very dark green, surface flat, edge a little undulated.

Nut resembles the 'White Filbert' in all respects save the bright skin with which it is covered, and the darker foliage.

Origin.—Of great antiquity, known to BAUHIN in 1623.

WEBB'S PRIZE.

Catkins $2\frac{1}{2}$ inches, rather thick, dirty yellow as 'Kent Filbert'; flowers a little after catkins; scale nearly yellow with slight dirty brown.

Shoots strong, a little geniculate, downy and with many glandular hairs.

Leaf held flat, not very rugose.

Nut long, large, very closely resembling 'Kent Cob,' perhaps better in flavour.

Raised by THOS. WEBB of Calcott, Reading.

WHITE FILBERT.

French 'Aveline Blanche Longue.'

Catkins $3\frac{1}{2}$ inches, moderately thick, rather open, *i.e.* scales far apart; scales dull green giving a dirty appearance. Females out often before catkins.

Growth strong, slender shoots, densely covered glandular hairs.

Leaf pale green, round tip down curved, margin a little waved, young leaves slightly brown red. Compact grower.

Husk quite covering nut and much drawn in at the tip, covered with glandular hairs. Nut rather small, long narrow; flavour excellent. Fertility rather irregular, due perhaps to lack of pollen; as a remedy interplant with 'Bergeri.'

In many seasons the females expand before the catkins; for this reason the early-flowering 'Bergeri' is recommended.

Origin.—This is one of the oldest of Filberts which has been grown for several centuries. It is known in France as 'Aveline Blanche Longue,' and to botanists as *Corylus tubulosa alba*.

CARNATIONS—THEIR PESTS AND DISEASES.

By MONTAGU C. ALLWOOD, F.R.H.S.

[Read September 6, 1919; Mr. A. GASKELL in the Chair.]

I INTEND to consider the subject of my lecture this afternoon more from a practical than a scientific standpoint. Some scientific men who lack a practical grower's experience may not entirely agree with some of the methods we employ, but the proof of the pudding is in the eating: our methods have proved effective almost without exception, and to be employed by a large commercial firm such as ours they must be economical. I, of course, have a great advantage in being associated with a large firm who cultivate Carnations by the acre under glass, as well as in the open, and where an expert is employed at the head of every department who is thorough master of his section of Carnation cultivation. I believe that there is no Carnation pest or disease which we have not mastered, and, furthermore, I believe that if others follow out our methods of cultivation, they will not be seriously troubled with disease upon their Carnations, no matter whether they are grown under glass or in the open.

The two main factors in having healthy Carnations is to start with a clean, selected healthy stock, and only to propagate *correct* cuttings and layers (see fig. 35). Just any sort of stock-cutting or layers (see fig. 36) will not do, and, moreover, when once a Carnation plant has become weak or unhealthy it is almost impossible to restore its health, particularly so in the case of perpetual-growing varieties, simply because they have no resting or dormant period to recuperate their health: furthermore, all perpetual-flowering varieties deteriorate in time, and their constitution can only be preserved by selection.

The second essential in good Carnation cultivation is the use of a correct fertilizer. I will go so far as to say that more Carnations are spoilt annually owing to the use of improper fertilizers than from any pest or disease. Half the highly concentrated fertilizers used upon Carnations simply act as a stimulant and undermine the constitution of the entire stock. A Carnation, to preserve its constitution, must have an evenly-balanced slow-acting *organic food*, one that develops all parts of the plant. If you endeavour to develop a flower abnormally, say for show purposes, at the expense of the plant, then your stock becomes ruined. An organic food in comparison with a chemical stimulant is like the body-building and lasting qualities of a beef steak to a whisky and soda. Excess of nitrogen in a highly concentrated fertilizer has ruined thousands upon thousands of Carnations.

Another matter to be considered when dealing with Carnation pests and diseases is the conditions under which the plants are grown. A Carnation plant must have light and air. There is no known substitute for that. If you coddle Carnations unduly you ruin them.

That brings us to another vitally important matter in the cultivation: the soil or compost in which they are grown. A soil too rich, or the addition of leaf-mould if persisted in, will cause deterioration in the plants. A Carnation enjoys a firm, sweet, moderately open soil.

The special diseases of the Carnation are :—

Stem-rot.—Of recent years this has become perhaps the most common disease among Carnations. It gives the grower no warning, the plants' stem diseasing just above the soil. This disease is more common among Carnations which are propagated by means of cuttings than in layers. Some growers contend that it is hereditary, but we do not agree with this contention, although certain varieties are more subject to it than others. In our opinion, it can be prevented but not cured. We have proved that it is brought about by two causes, the principal one of which is rooting the cuttings in unsuitable sand, such as a sand that contains iron in large quantities, or one very fine in texture which practically turns to mud when watered, and settles down like cement. This quickly turns sour. Also, if the cuttings are allowed to remain too long in the sand after rooting they become hardened and checked. Deep potting will also cause stem-rot: in fact, we have found that stem-rot commences at a buried joint, and it is most essential that as little of the stem of the plants should be buried as possible.

Fungus Diseases on Carnations.—These are looked upon as the bane of Carnation life. The principal diseases are Rust (*Uromyces caryophyllinus*), Spot (*Septoria dianthi*), and Fairy Ring Spot (*Heterosporium echinulatum* (fig. 37)). What I particularly wish to point out here is that under correct cultivation, if the plants are given normal treatment, no fungus diseases will trouble you. A close, moist, humid atmosphere will encourage fungus disease, but a fresh buoyant atmosphere will destroy it. Many of the remedies advised simply aggravate the disease, ruin the plants, and destroy the bloom upon the foliage. This does not apply to plants grown under glass only, but also in the open. A simple and effective method for combating a fungus disease on Carnations is to cut off all affected leaves and burn them, and dust the plants with a mixture of sulphur, air-slacked lime, and copper sulphate, previously prepared and treated. This destroys the spores of the disease without affecting the foliage of the plants. During the summer months, when the atmosphere is hot and dry, we use an occasional spraying of the plants with a liquid preparation of copper, ammonia, and distilled water, as a preventive.

Bacteriosis or Stigmonose (Bacterium dianthi).—In appearance, this is simply yellow, translucent spots on the leaves, which are destroyed cells, and are seen very plainly when the leaf is held up to the



FIG. 35.—CARNATION. A FLOWERING GROWTH WITH CUTTINGS FIT FOR REMOVAL. The top cutting should be discarded, for it would produce but a weak plant. The three below should make strong healthy plants. The bottom one is too slow-growing.

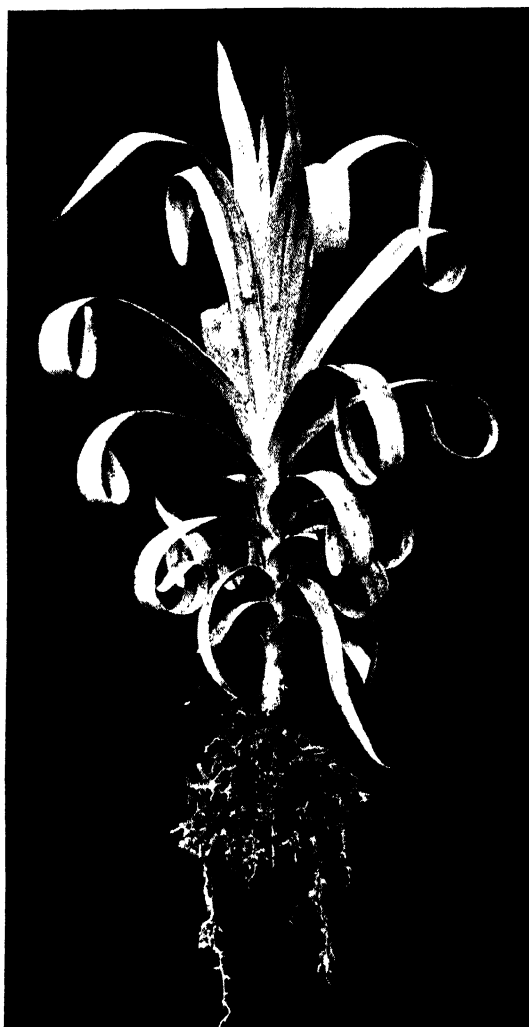


FIG. 36. - A WELL-ROOTED CARNATION LAYER.

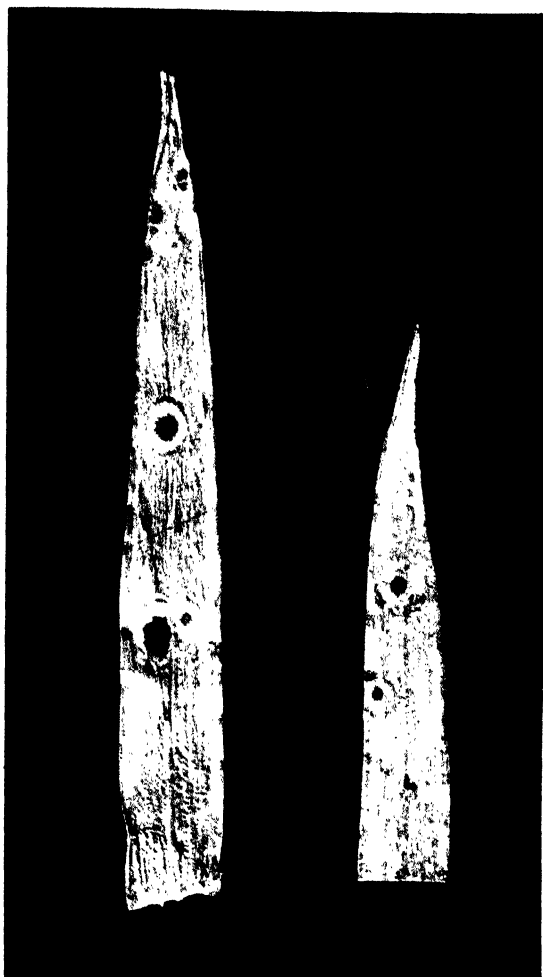


FIG. 37. CARNATION FAIRY RING LEAF-SPOT
(*Heterosporium chlamydosporum*).

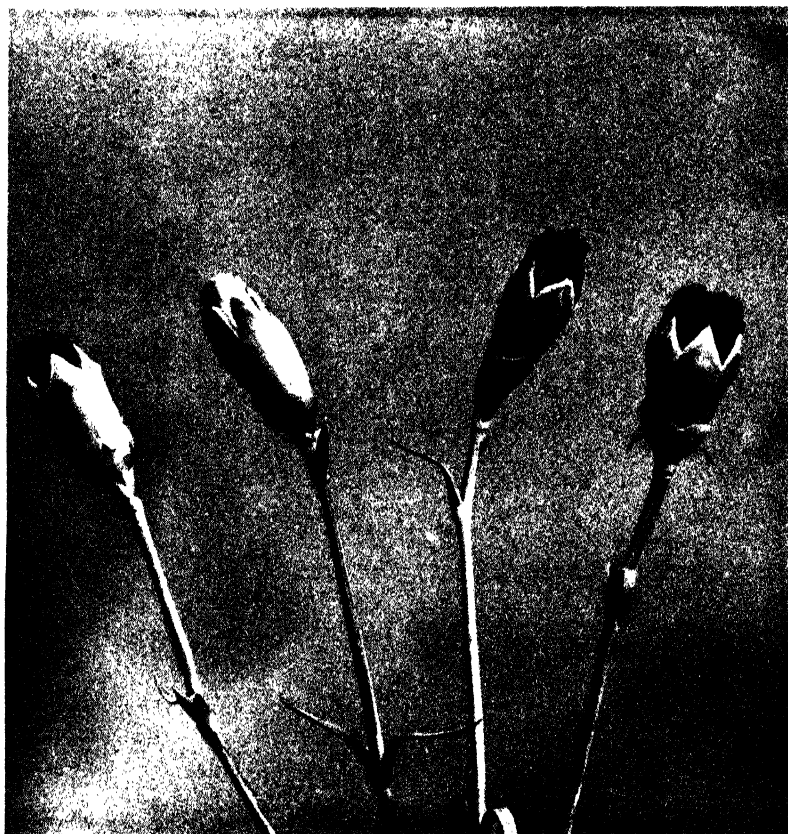


FIG. 38.

[To face p. 55.]

light. In the spring of the year these yellow blotches are much more noticeable on the leaves, particularly in certain varieties. This disease is caused in the first place by green-fly, thrips, or other sucking insects, which leave a poison in the leaf when the proboscis is withdrawn. If the constitution of the plant is weak this poison permeates the whole plant, and is increased by propagation of the cuttings or layers, but if the plant is constitutionally strong it can throw off the poison. It continues to grow freely and healthily, providing all other cultural details are correctly carried out. Of course, it is not a contagious disease, but it is idle folly to propagate from affected plants. To stamp out Bacteriosis it is not only necessary to select strong, healthy cuttings, but to propagate from vigorous healthy plants only.

Red Spider (Tetranychus telarius).—This pest, which is so well known, has ruined more stocks of Carnations than any other insect pest. It attacks Carnations as a rule under glass during June, July, and August, owing to the atmosphere being too hot and dry; weakly, unhealthy stock invites it. Again, if the growth of the plant is checked through improper feeding or lack of potting, and neglect to syringe the plants thoroughly and periodically in hot, dry weather, the best and only really effective remedy is to syringe the plants, at very high pressure on bright mornings, particularly the under sides of the leaves, with clear cold water, and once every fourteen days with Nicotine Extract, specially prepared for Carnations, avoiding preparations which contain soap extracts or similar compounds, which leave a deposit upon the leaves and are more harmful than beneficial to the plants.

The common green Aphis and black-fly are the simplest of all pests to eradicate. A single application of the nicotine preparation is sufficient to cleanse the plants entirely. The antiquated system of fumigating, so far as Carnations are concerned, has proved with us more harmful than effective, inasmuch as the life of the flower is shortened, the growth of the plant is checked, and only the active pest is destroyed. Furthermore, we are of opinion that the fumes have certain detrimental actions upon the soil, and we are extending our experiments on a large scale to test this theory.

The common summer thrips (*Heliothrips tabaci*), which is the only one that troubles the Carnation-grower, and appears to be Nature's gift to all horticulturists, disfigures the flowers during the summer and early autumn, and is effectively destroyed by periodically spraying with the same Nicotine Extract which I have previously recommended for red spider.

Split Calyx.—This, of course, is not caused by any pest or disease, but in the case of proved varieties is the result of irregular growth caused by irregular conditions in the soil, affecting the growth of the roots, or irregular climatic conditions affecting the growth of the plant, or, as is too often the case, the use of unsuitable fertilizers. The ideal calyx with well-rounded calyx claws—which act as a spring, as seen in the two outside buds (see fig. 38)—rarely if ever split, while the tube-

like calyx, of the two centre buds are very subject to this weakness. The curling of leaf-tips is also caused by irregular conditions or a check, and the only remedy is to give the plants better cultivation and liberate the outer leaves of the young growth.

Soil pests include wireworm, the three species of Agriotes, eel-worm (*Tylenchus devastatrix*), leather-jacket grub (*Tipula oleracea*), earthworms, &c. We deal with all these in the same way, by ploughing up in the spring of the year two or three acres of grass turf, sufficient to supply our year's soil requirements from the following autumn. This is ploughed from 4 to 5 inches, and a large number of chickens are allowed to pick it over. When the grass is partly killed it is cross-ploughed, afterwards scarified, then harrowed. During all this time the chickens are picking out the insect pests, and in the late summer, when carted into the soil sheds, there is little to trouble about so far as insect pests are concerned. But for our special seedlings and novelties the soil is sterilized by steam. This we do during the summer when the soil is very dry, so as not to spoil its texture. I have not dealt with enriching the soil, because it is outside the scope of the lecture. We are well acquainted with all the soil fumigants and other methods of ridding soil of insect pests, but, for practical business men, something must be found more effective before they will be generally commercially adopted. If we are troubled with wireworm in any of our commercial cut-flower houses or trial beds, even in the fields where *Dianthus* $\times$ *Allwoodii* and Perpetual Border Carnations are grown, we resort to the preventive method of trapping the pest with pieces of carrot or potato. This work is done by school children, who are paid so much a hundred insects caught, and we very easily and cheaply clear the ground; but where the soil is firmly trodden or rolled, little trouble from soil pests need be feared.

THE PARTIAL STERILIZATION OF SOILS.

By E. J. RUSSELL, D.Sc., F.R.S., Director of the Rothamsted Experimental Station.

[Read October 21, 1910; Mr. A. W. SUTTON, V.M.H., in the Chair.]

INVESTIGATIONS in recent years have shown that the upper layer of the soil is inhabited by a highly complex and very numerous population of micro-organisms. Among them are bacteria, some of which are only $\frac{1}{500,000}$ inch in length; there are flagellates, amoebæ, and fungi, which are much larger; eelworms, which are larger still, being as much as $\frac{1}{25}$ inch in length, and finally there are numerous visible inhabitants—wireworms, ants, earthworms, and others. All this population is dependent in the last instance on the plant. As regards part of the population the dependence is reciprocal; the plant also depends on the organisms. But as regards many members of the soil population this reciprocity does not hold; the plant gains nothing, but on the contrary loses, by the activity of some of the soil inhabitants.

Under natural conditions, therefore, one has to think of the soil as carrying not only surface vegetation but also a large invisible population of other living forms; there is a certain amount of mutual interdependence between the various members of the flora and fauna, but also some antagonism; the plant does not grow as well as it might. Under the artificial conditions of agriculture and horticulture it is desired to secure the best possible conditions for plant growth, and this involves the control of the soil population.

There are two methods of procedure. The straightforward method is to analyse the soil population, ascertain what members are useful and how they may be encouraged, and what members are harmful and how they may be eliminated. In practice this presents many difficulties and it is very tedious and extremely slow; it is, however, eminently sure.

A second method of approach has been opened up by the discovery made some years ago that a considerable degree of simplification of the population of micro-organisms could be obtained by mild, not too drastic, killing processes. Fortunately the organisms harmful or less useful to the plant tend to be killed before the more useful organisms; hence simplification of the soil population enhances soil fertility. The improvement is strikingly seen in two directions; there is an increase in the supply of nitrogen compounds available for plant nutrition, and a decrease in the pests and in the organisms causing plant disease.

The possibility of increasing the amount of plant food in the soil by

partial sterilization was discussed in the Masters Lectures for 1915 (see JOURNAL R.H.S., vol. xli. p. 173). It seemed at first to be of academic rather than of practical interest, and the few efforts made at Rothamsted to apply the method on a large scale promised so little success that they were not continued. While productiveness could be increased by this method the result was no better than could be obtained considerably more cheaply by the use of a quick-acting nitrogenous manure.

But the case is quite different when disease organisms are present. Here some of the soil population seriously interfere with the growth of plants and cannot be put out of action by the simple device of adding manure. Partial sterilization is found to be an effective, and in some cases the only, remedy. The best prospects for partial sterilization in practice are therefore afforded when disease organisms, pests, or some form of soil sickness, have to be dealt with.

The case first studied was the sick soil of glasshouses. The older method of throwing away this soil is extremely wasteful.* In many of the soils examined specific disease organisms occurred; in others there was no recognized disease, but only the condition vaguely known as sickness. Experiments showed that the killing of some of the soil organisms, whether by heat or by poisons, was followed by an improvement in the health of the plant and an increase in the crop.

The earliest experiments were made with tomatoes grown in sick soils supplied by growers in the Lea Valley. The experiments were conducted in pots and gave the following results:—

	Soil B.		Soil M.C.	
	Plant weight.	Fruit.	Plant weight.	Fruit.
Untreated	100	100	100	100
Heated to 200° F.	163	204	188	255
Treated with Toluene	139	110	144	200
„ Carbon disulphide	116	124	138	179

Much smaller differences, however, were obtained in borders in a commercial nursery where there was no striking amount of disease, and the plants were grown in the usual way, supplied with the “base manure” dug into the soil before planting, and the usual liberal top dressings.

* A recent examination of cucumber soils thrown out from the houses is as follows:

	Per cent. of dry matter.	
	A	B
Nitrogen	1.30	0.88
Phosphoric acid (P_2O_5)	1.03	0.82
Equivalent to tricalcic phosphate	2.24	1.79
Potash (K_2O)	0.81	0.69
Carbonates (as $CaCO_3$)	5.23	4.29

A was fairly recently thrown out; B had been thrown out three years before.

Some of the weights of tomatos obtained were :—

	Nursery No. 1.		Nursery No. 2.	
	1917.	1918.	1917.	1918.
Untreated	100	100	100	100
Steam	95	112	126	109
Hot water	96	109	96	109
Carbolic acid	107	105	111	112
Formaldehyde	103	113	92	—
Tons per acre : 100 represents . . .	34.4	35.8	27.1	35

Further experiments have thrown considerable light on the apparent discrepancy in results. It has been shown that tomatos in pots are liable to suffer from nitrogen starvation and therefore respond to the additional nitrogen supply resulting from partial sterilization. Tomatos grown in borders, however, are far less liable to nitrogen starvation ; indeed, at the Cheshunt Experiment Station they show no response to nitrogenous fertilizers, but rather the reverse ; in soils more remote from the virgin condition a more pronounced effect might be obtained, but probably not as marked as would be given by a nitrogen-loving plant such as wheat. The manure supplied in the borders suffices for the less exacting tomato plants and little is gained by the additional nitrogen nutrients resulting from partial sterilization.

But although the actual yields are not much improved there is a notable increase in vigour and healthiness of the plant, and a corresponding increase in the certainty of the crop. Insect and fungus diseases are checked or even suppressed ; the roots are clean, especially on the steamed plots. The benefit becomes more and more marked as the amount of disease increases, and in badly diseased houses the crop is greatly improved as the result of sterilization. Figures are difficult to obtain, but Mr. LISTER gives me the following, showing yields of tomatos in badly infested houses, before and after treatment :—

		Nursery A.		Nursery B.		Number of clubbed roots in house of 3000 plants.	Nursery No. 2. tons an acre.
		lb. a plant.	tons an acre.	lb. a plant.	tons an acre.		
Before treatment	1916	2.75	22	—	—	—	—
„ „	1917	—	—	4.54	30.9	500	35
After treatment with steam	1917	5.25	42	—	—	—	—
„ second treatment	1918	5.2	41.6	—	—	—	—
„ carbolic acid	—	—	—	5.64	38.0	55	40

Steam is so effective that it would invariably be adopted if questions of cost and convenience never arose. It not only kills animal pests, ova and larvæ of eelworms, wireworms, woodlice, &c., and reduces fungi, but in addition it brings about a certain amount of decompo-

sition, thus greatly facilitating the work of the soil organisms. A steamed soil is therefore not only a healthier but also a richer medium for plant growth than a corresponding untreated soil. There is a tendency to retardation of germination and to some rankness of growth in heated soil, but this can be overcome by modifying the manuring and by growing easily setting varieties such as 'Ailsa Craig.' But so great are the advantages that many growers of cucumbers and tomatoes in the Lea Valley now heat their soil as a regular part of their procedure, either by steam or hot water (figs. 39, 40).

Unfortunately heating the soil is not only inconvenient but also costly. In the palmy days before the War the lowest cost at which it had been done so far as I know was £24 an acre. Present costs are very considerably above this. Two statements taken from the books of large commercial nurseries showing the cost for a house in winter 1918-19 was as follows :—

	Nursery No. 1.			Nursery No. 2.		
	£	s.	d.	£	s.	d.
Labour*	12	0	0	4	10	0
Coke†	19	8	0	4	1	0
Boxes, boilers, &c.	5	0	0	4	0	0
Total for one house	36	8	0	12	11	0
Total for an acre	300	0	0	87	17	0
Time taken for a house (about ½ acre)	16	days		3	days	

Nursery No. 1 was badly infested so that work could proceed only very slowly. Nursery No. 2 was much more lightly affected; the crop was 35 tons an acre, which is quite good. After steaming, it was raised to 40 tons an acre, about as good as a commercial grower hopes to attain. It is doubtful whether steaming would be worth while in a house where the yield is already 40 tons an acre, as in these circumstances there can be no serious number of disease organisms or pests.

Three general methods of heating the soil have been adopted :—

1. By steam, using the tray or box method.‡ This is applicable for large-scale work; the tray method being suitable for soils heated *in situ* such as tomato borders, and the box method for soils that have to be moved, such as cucumber borders.

2. By baking, using waste heat from flues or boiler, or in a special oven heated by coke. This is most convenient for small scale work such as the purification of soil needed for the raising of seedlings in nurseries where the damping-off fungus causes trouble, and the treatment of composts in private glasshouses.

3. By hot water, using water from the pipes, heated if necessary in a supplementary cylinder.

One grower, who successfully adopts this method, applies 64,000

* 2½ men each 36 hrs. @ 1s.

† 15 cwt. a day @ 36s. a ton.

‡ See *Jour. Board of Agriculture*, 1913, vol. xix. p. 809 and 1914, vol. xxi. p. 102, for the essential features; there are, however, modifications in detail introduced since these papers were written.

gallons an acre of water at 200° F. in November, and a further 160,000 to 240,000 gallons an acre later; in all equivalent to 10–15 inches of rain. Pumping costs 2*d.* for 1,000 gallons, heating by a steam injector costs 2*s.* to 2*s.* 6*d.* for 1,000 gallons; the cost is therefore £4 10*s.* a house, or £36* an acre. The method is not as effective as steam, and plants sometimes take on a curiously mottled appearance indicating some obscure physiological effect.

However the heating is done, it is costly and inconvenient, and there is no possibility of reducing the cost indefinitely; the number of thermal units needed to heat a given weight of soil can readily be calculated, and however good the method it can never exceed 100 per cent. efficiency. Even in theory one ton of fuel cannot heat more than 130 to 250 tons of moist soil, or 340 tons of dry soil, from 52° F. to 212° F., no matter how the process is done. In practice 1 ton of coke may bake 40 tons of soil for 24 hours, while 12 tons or more are needed to steam 1 acre of soil.

Chemical methods of partial sterilization are much more convenient and potentially much cheaper, since there is no limit to the reduction in cost as in the case of heat. Many efforts have therefore been made to find suitable agents. A difficulty arises, however, which heat does not present. After a soil has been heated it cools, and the deterring effect of heat is not exercised on the plant. But chemicals may persist; they may indeed poison the crop. It is essential that the substance disappear from the soil after its work is done, either by evaporation or by one of those remarkable oxidations or decompositions brought about by living or other agencies in the soil.

In the first experiments at Wye and at Rothamsted volatile antiseptics only were used because they readily evaporate from the soil and present no danger of after-effects. Volatile antiseptics were effective in throwing out of action some of the soil population that impede the action of the ammonia-producing organisms; they therefore brought about a larger production of ammonia in the soil and so increased productiveness.

They were, however, difficult to handle in practice, and the two with which we had most experience—carbon disulphide and toluene—had the disadvantage of being inflammable. The railway companies refused to carry them in ordinary goods trains, and when they finally reached the experimental centres the workmen did not treat them with proper respect. These difficulties might have been overcome—indeed, the ingenious Monsieur TRUFFAUT has overcome them, so far as carbon disulphide is concerned, by making an emulsion; but a more serious difficulty presented itself. The antiseptics were not always equally effective; in some cases they were very useful, in others they were not, toluene especially being liable to fail in moist soils. They were nothing like as reliable as heat, for while heat could be depended upon with a great degree of certainty, they could not.

* In this case there are eight houses to the acre; the more usual number in the district is seven.

Another substance that proved better was cresylic acid, the main constituent of the coal-tar acids on the market during the War. Under the name of "liquid carbolic acid" it used to be sold at 2s. a gallon; it is now double that price, but it may fall to something approaching the pre-War level. Although it does not volatilize from the soil it is readily oxidized by soil bacteria with formation of products that do no harm to plants. After a short period, therefore, the plants can be set out in the treated soil without fear.

The method of using cresylic acid is to add one gallon of the acid to 40 gallons of water and apply the mixture to 9 to 18 sq. yards, *i.e.* 40 to 80 gallons a house, then heavily watering; in the case of heavy soil the acid is applied in two doses at an interval of 14 days; the land must previously have been dug over to a depth of 1 spit. Planting can begin at the expiration of one month. Pot experiments show that some degree of watering is necessary, otherwise plants become abnormal; the foliage becomes variegated and the setting of the trusses hampered.

One gallon to 9 sq. yards is 79 gallons a house: the cost of 79 gallons "liquid carbolic acid" @ 4s. the gallon is £15 16s. a house. 49 cwt., costing £105, are needed for an acre.

The half strength is more usual; this costs £52 10s. an acre.

This larger quantity corresponds to about 0.22 per cent. of the soil, or M/50 in the notation explained later. Good results, however, are commonly obtained with the half or M/100 dose, and there is little doubt that the price could come down; assuming it fell to 2s. a gallon, the cost would be only £25 an acre where the half dose proved sufficient.

On an average of results, carbolic acid is less effective than steam. Thus in blocks of houses under commercial management the following yields of tomatos have been obtained.—

	A.	B	C.	
Steam	26.0	32.4*	30.8	} tons an acre to end of September.
Cresylic acid	25.4	22.6	27.3	

The cresylic acid fell far behind steam in B, and distinctly behind in C.

Other chemicals have shown similar inferiority to heat.

The inferiority of chemicals lies in the fact that they are less certain to act in any given case than heat. Further investigation has emphasized the important fact that diseases and sicknesses of soil are not one but many, and the only rational way of using chemical agents is to do what medical men did in the case of human beings—make a proper diagnosis of the cause and then seek a specific remedy.

* Steamed with grids: 30.3 tons an acre when steamed with trays.

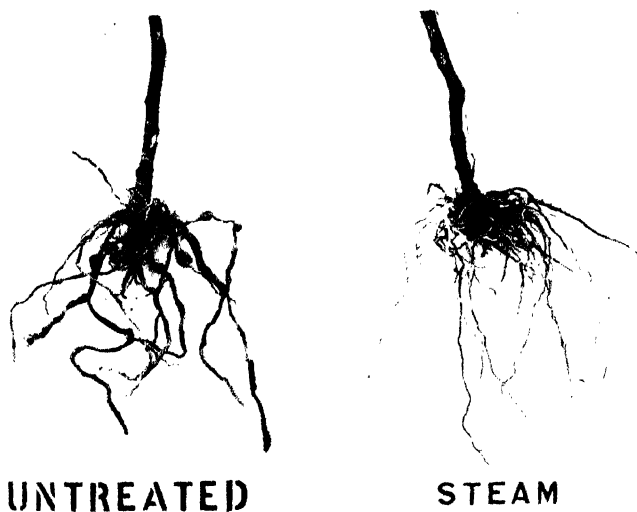


FIG. 39. Steamed soil is a healthier medium for plant growth than untreated soil infested by eelworm. The root labelled "untreated" shows the "knots" caused by eelworm; the other, labelled "steam," is free.



FIG. 40.—Tomato plants from a large commercial nursery. The left-hand one is grown in steamed soil, the right hand one in the same soil unsteamed.

[To face p. 242.

In order to use chemical substances for the control of the soil population it is therefore necessary to know exactly what organisms are to be dealt with, and to carry out direct experiments with those organisms to ascertain the effects of the antiseptics on them.

It is well known that poisons have a marked selective effect on organisms. A substance may prove fatal to one kind of organism but not to another; there has to be a relationship between the particular cell substance and the particular poison before killing occurs. Heat, on the other hand, kills everything.

Our first remedial scheme was drawn up as the result of observations in the nurseries. It was as follows:—

Disease.	Agent tried.		
	Steam.	Cresylic Acid.	Formaldehyde.
" Soil sickness "	Effective	Effective	Effective
Wireworm	Effective	Not effective	Not effective
Club	Effective	Fairly effective	Not certainly effective
Sleepy disease	Effective	Not certainly effective	Not certainly effective
Fusarium	Effective	Not effective	Frequently effective
Damping off	Effective	Not effective	Effective
Root fungus	Effective	Not effective	Effective
Stripe	Not effective	Not effective	Not effective

This chart indicated the proper method of attacking the problems and has been adhered to in all subsequent work.

Analysis of the soil population is made and the effect of different substances on the individual is studied. The work is difficult and highly specialized.

Fortunately Mr. W. B. RANDALL of Waltham Cross came forward at a critical moment and generously provided funds for the appointment of a competent biologist, and fortunately also we were able to interest Mrs. D. J. MATTHEWS (formerly Miss ISGROVE) in the problem; she therefore undertook the work.

The method of procedure is as follows. The analysis of the soil population is made partly by the plant and partly by the scientific investigator. The indications of the plant are sometimes definite; for example, Root-knot indicates the eelworm *Heterodera radiculicola*, sleepy disease indicates *Verticillium*, damping off indicates *Pythium*, &c. Laboratory methods have been worked out at Rothamsted for studying other members of the soil population.

Having thus made a survey of the population to be dealt with, the investigator finds some means of estimating the number in one gram of soil of the particular organism on which he is working. Then the soil is treated with a certain weight of the antiseptic; another lot is treated with $\frac{1}{10}$ that weight; others with $\frac{1}{50}$, $\frac{1}{100}$, and so on. On chemical grounds it is better to take the molecular weight and not

an arbitrary weight as the standard; thus for 1 gram of soil the number of milligrams of various substances added would be :—

$$\begin{array}{ccc} \text{Molecular weight,} & \frac{\text{Molecular weight}}{10}, & \frac{\text{Molecular weight}}{50}, \\ & \frac{\text{Molecular weight}}{100}, & \frac{\text{Molecular weight}}{200}, \end{array}$$

or, as it is usually and more briefly expressed,

$$M, \quad M/10, \quad M/50, \quad M/100, \quad M/200, \text{ \&c.}$$

Counts are now made of the numbers of the organisms present in each lot of soil and the limit is found beyond which the organism will not survive. Thus the organism may be apparently unaffected by the M/200 dose, not much reduced by the M/100; it may be seriously diminished by the M/50 dose and completely suppressed by the M/10 dose. The toxic dose therefore lies between M/10 and M/50, and would be expressed as M/10 to M/50.

A derivative of the substance is then made by the chemist by introducing a new group; the effect of the new substance is then tested.

Supposing the toxic dose is now M/10 to M, the new substance is obviously less effective than the old. The chemist therefore tries in some other direction. Supposing the new group increases the toxicity so that the toxic dose becomes M/50 to M/100, this represents a distinct improvement. The chemist therefore goes further in the same direction and introduces another group of the same kind. The toxicity may be still further increased. A third group is then introduced; there may be a still further increase, or, on the other hand, no increase at all in toxicity.

In this way numbers of groups can be examined and their effects ascertained. As an example, the effect on the wireworm of certain groups, ascertained by Messrs. TATTERSFIELD and ROBERTS, may be quoted :—

AMOUNTS REQUIRED TO KILL WIREWORMS.
(Gram Molecular Weights.)

Basal Substance.	Added Group.	One Group.	Two Groups.
Benzene 100	Methyl	54	30
	Chlorine	26	8
	Bromine	14	—
	Iodine	6	—
	Amide	3.5	Non-toxic
	Nitro	3	Non-toxic
	Hydroxyl	1.4	—
	Chlormethylene	0.5	—

One of Mrs. MATTHEWS' tables for celworm, fungi, and protozoa is as follows :—

	Toxic Dose for		
	Earthworms.	Fungi.	Protozoa.
Cresol	M/10	M/2-M/10	M/10
Monochlorocresol	M/50	M/10	M/10
Dichlorocresol	M/50	M/10 M/50	M/50
Chlordinitrobenzene . . .	M/200-M/500	M/200-M/500	—
Sodium cyanide	M/50	—	M/10

The work is necessarily slow but it has the merit of certainty.

When promising substances are found they are examined more extensively. Pot experiments are made. These are slower and require much more space than laboratory experiments; indeed, they can only be done when the preliminary laboratory experiments have allowed a selection of substances to be made.

Of the numerous pot and plot experiments now in hand at Rothamsted and the Lea Valley, figs. 41 and 42 illustrate both the possibilities and the dangers. At the commencement of the investigation the so-called liquid carbolic acid (really cresylic acid) was the most convenient of all chemical substances for large-scale use, and it was, and still is, widely adopted. The laboratory experiments, however, have shown that its effectiveness against earthworms and fungi is much improved by introducing chlorine atoms. Pot experiments confirm this result. The dichlorocresylic acid is seen to be much more effective than the cresylic acid in helping tomatoes in a soil infested by earthworms or fungi. It also causes greater production of ammonia. It happens, too, to be more convenient to use, and need not necessarily be much more expensive.

Figure 42, however, also illustrates the dangers of the method. Laboratory experiments indicated that even more striking effects would be produced by adding a nitro group to the chlor- derivative. Chlordinitrobenzene is toxic both to earthworms and fungi in the very small dose lying between M/500 and M/200; it is, indeed, the most potent poison we have yet found. Unfortunately it is also highly toxic to plants. In this it resembles most of the other antiseptics; its distinguishing feature is that it does not easily decompose or disappear from the soil, so that for a long period it persists and is liable to injure the plant.

The question of disappearance from the soil is of very great importance. Phenol, cresol, and the chlorcresols quickly decompose and become innocuous; the nitro- compounds, however, do not. From the chemical point of view, interesting possibilities are presented by these and certain other compounds which, having acted in the first instance as partial sterilizing agents or soil insecticides, may proceed to decompose and give rise to valuable plant nutrients. Calcium sulphide is an instance; it is an effective sterilizer and it soon gives rise to valuable calcium carbonate. Sodium cyanide is effective

against eelworms, though not against fungi, at M/50 to M/10 ; after it has poisoned them it breaks down apparently to sodium formate and ammonia, the former of which acts as a weak alkali and therefore counteracts acidity, while the latter is a valuable plant nutrient.

Pyridene also gives rise to ammonia in the soil, though here the change is more obscure.

The nitro- compounds are of special interest because they happen to be available in large quantities at the present time. Some of them have marked toxic properties to eelworms and fungi, but they are also harmful to the plant. Picric acid is one of the commonest of these ; it is at first very injurious to plants, but after a time it disappears from the soil, for the new vegetation shows little or no sign of harmful effects. After a sufficient interval is allowed to elapse the picric acid acts as a potent fertilizer. Some of the nitro- group may become converted into nitrates in the soil, but the evidence is not yet clear. Experiments on this important subject are in hand.

Besides these systematic investigations, which, as already indicated, are necessarily slow, progress is also possible by enlightened empirical methods, in particular by testing large numbers of substances direct on the growing plant. M. TRUFFAUT has used this method successfully at Versailles and has obtained results which he published in his journal, *Jardinage* (fig. 43). Since the armistice the Chemical Warfare Department has furnished us with one or two interesting substances now under investigation.

One of the best of these is chlorpicrin, which is of great value as a partial sterilizing agent ; it is fatal to eelworms and wireworms, and harmless to plants ; indeed, it promotes root action to a remarkable degree (figs. 44, 45). Further, it can at present be obtained cheaply and in quantity.* It is, indeed, an excellent substance for the horticulturist, and its effects are shown in figs. 41, 44. Unfortunately, it is awkward and dangerous to handle ; the worker needs a mask, and he may profoundly incommode unfortunate maskless bystanders.

The work, however, has gone sufficiently far to show that the main lines are right. The analysis of the soil population and the study of the effects of definite chemical substances on the organisms involve long and difficult problems, but in solving them we shall gain that control over the soil population that we need for the most intensive horticultural and agricultural practice. There is a gap, but not an impassable one, between the science of to-day and the practice of to-morrow. If the science is right the practice will come.

SOME IRISH GARDENS.

By J. G. WESTON, F.R.H.S.

[Read May 27, 1919 ; Rev. J. JACOB in the Chair.]

I FEEL that before commencing my paper on "Some Irish Gardens" I ought to explain why I, a gardener in Kent, have taken this subject, and in doing so I must give you a little personal history.

After a pretty thorough training in some of the larger English gardens, I was fortunate in being engaged in 1897 to go as gardener to the Earl and Countess of BESSBOROUGH at Bessborough, in Co. Kilkenny. I spent eight years there, and look back with a great deal of pleasure to the time I passed in the Green Isle.

Those of you who know Ireland are very well aware of the lovely gardens that exist in all parts of that delightful country--those who do not happen to have visited there would scarcely credit the almost tropical vegetation that abounds in the gardens, parks, and woodlands of Ireland.

During my eight years there I was able to visit many of the gardens I am speaking about this afternoon ; in other instances, where I have not visited, the owners and their gardeners have been most kind in assisting me with photographs and notes of various garden subjects.

Amongst those charming scenes there are few that surpass Bessborough, whether in the beautiful natural scenery of the surrounding country, or in the many choice subjects which flourish in the garden proper. Lying in the fertile valley of the River Suir, between Waterford and Clonmel, the soil and climate are both eminently favourable for gardening ; in fact, I have often thought that in Ireland plants, and also fruit and farm crops generally, thrive almost too easily to be properly appreciated. It is certain that with many gardeners it is a good result after strenuous efforts, which affords real gratification.

Not only do the majority of shrubs and garden plants thrive so well at Bessborough, but hardy fruit succeeds in a manner which is a revelation to the casual visitor, who often has very dreary and erroneous ideas about Ireland generally, associating its vegetation in his mind principally with the potato !

When first taking charge of the Bessborough gardens I found that though some of the old fruit trees bore excellent crops, very few young trees had been planted. We started to remedy this the first autumn, eventually planting up a new orchard. In the year of the Cork Exhibition (somewhere about 1902) a large fruit show was held in the autumn to show what could be grown in Ireland, and,

though some of the specimens staged at that time would have rather shocked our best growers over here, the fruit from the Bessborough district came out so well that as an outcome of this show a scheme was drafted by the Irish Board of Agriculture to plant up separate acres of various kinds of fruit trees and bushes on twenty small farms in this locality, and an expert was placed in charge of them, to instruct the farmers in the best methods of fruit cultivation, grading, packing, and getting on the markets. These plots succeeded well, and so much good resulted from this scheme that it was eventually decided to double the number of plots in that district.

One of the best answers to the question of how the plan succeeded is the fact that for several years fruit has been successfully exhibited at the R.H.S. Fruit Show in London from one of these small farms. From Bessborough Gardens alone in seven years over thirty first prizes have been awarded for fruit exhibited in the open classes at the same show in London, besides holding its own at the shows held in Dublin and Belfast.

Stone fruit does admirably at Bessborough; peaches, nectarines, and plums, and, in two years out of three, apricots of exceptional quality are grown.

One of the first improvements taken in hand by the Countess of BESSBOROUGH was the formation of a combined rock-and-water garden. When making the excavations for the ponds, the soil was thrown up to make a high bank on the side farthest from the walk. This bank was planted with a great variety of plants, with a view to providing an immediate effect, but with the idea of weeding out anything which eventually proved unsuitable. *Gunnera manicata*, throwing its gigantic leaves over the water, bamboos such as *Arundinaria anceps*, *A. nitida*, *Phyllostachys flexuosa*, *P. Henonis*, *P. aurea*, *P. nigra*, and *P. viridi-glaucescens*, with *Bambusa palmata* and *B. fastuosa*, such Berberis as *Darwini*, *B. stenophylla gracilis*, *B. Thunbergi*, and *B. virescens* were planted to hang over the rocks, placed close to the water's edge, with Hydrangeas in variety, *Cordyline australis*, *Phormium tenax*, *Eulalia zebrina*, *E. japonica* var., and *E. gracillima*, *Osmunda regalis*, *Aralia Sieboldi*, Spiraeas in variety, and other smaller species close to and even in the water.

Behind the plants named and farther away were clumps of *Arundo Donax* and *A. conspicua* (the noble summer-flowering Pampas), *Polygonum sachaliense* and *Gyneryums* in variety, *Eucalyptus Globulus*, *Leycesteria formosa* and *Arbutus Unedo*, the whole having as a background a large clump of evergreen oaks. In this part of the garden we depended for colour at the various seasons of the year on bold clumps of the more showy herbaceous perennials, such as *Epilobiums*, *Lythrums*, *Irises* in variety, *Doronicums*, *Heleniums*, *Pæonies*, herbaceous *Poppies* and *Phlox*, *Lupins* (both the herbaceous and tree *Lupin*), *Anemone japonica*, *Rudbeckias*, *Veronicas*, and *Kniphofias*.

In the water itself were planted choice varieties of *Nymphæas* and

other water plants, like *Carex pendula*, the sweet flag (*Acorus Calamus*), *Butomus umbellatus*, and *Cyperus longus*. Near a rustic bridge lower down the stream little waterfalls were made, and at the highest part a small rockery, with the plants hanging down into the water, the highest point of all, being in the shade, was planted with a collection of ferns. No hard and fast line was followed in order to confine oneself to any one class of plant, and the background consists of Bamboo, Yuccas, Veronicas, Cordylines, and hardy palms. Lower down the stream clumps of *Libertia formosa* and Pæonies, and many other flowering plants, are grown in the grass. Every advantage was taken of old tree-stumps to plant climbing roses in great variety; and, by growing immense quantities of bulbs in the grass, clumps of Rhododendrons and other flowering shrubs, floral effects were created for the greater part of the year. In this part of the garden were clumps of *Kniphofia*, Polygonums, *Rhus typhina*, *Berberis*, *Anemone japonica*, hardy Fuchsias, of Bamboo, including *Arundinaria nitida*, *A. anceps*, *A. Hindsii*, and *A. spathiflora*, *Bambusa fastuosa* and *palmata*, with *Phyllostachys aurea*, *P. Boryana*, *P. Castillonis*, *P. flexuosa*, *P. Henonis*, *P. mitis*, *P. nigra*, *P. Quiloi*, and *violascens*.

The wilderness forms a connecting link between the water-garden and the pleasure-grounds proper and the woods beyond.

The main central walk in the kitchen garden is flanked by herbaceous borders, over 300 yards long, cross borders bringing up the total length to over 600 yards. These borders were planted with a great variety of herbaceous perennials and bulbs, any blanks that occur being filled with annuals. Bush fruit trees formed the background to these borders. One of the last pieces of work carried out in my time was the erection of a pergola. This, made of stout larch trees, was of severe classical design, and was planted with a variety of climbers, eventually proving a great success.

In 1912 other types of gardening were introduced, and not far from this spot a flagged garden with a summer-house at the top of the walk was erected.

The paths are flagged with slate slabs from a neighbouring quarry, and are placed so as to provide space for alpenes and other small plants.

The mansion stands on high ground; and from the windows, and also from the terraces in the garden, magnificent views of the surrounding country are obtained, the Comeragh Mountains being seen in the background. A fountain was made in 1911, Arum Lilies being planted round the central figure, these flowering splendidly each season.

Beyond the terrace wall and not far from this spot is the formal flower-garden, laid out in Italian style. Fine views are obtained from the steps leading to this garden. Near these steps and under the terrace wall is a narrow border, which was planted up principally with China roses, but amongst other things which I distinctly remember planting close to the wall were some plants of the Californian Poppy, *Romneya Coulteri*. How well this has succeeded is now

shown, and the figures are as given in the *Gardeners' Chronicle* of September 16, 1916, which show the amount of ground this plant covered at that time.

Quite recently I have seen letters in the *Gardeners' Chronicle* in which the writers say that they consider the *Romneya* to be a much overrated plant; but those correspondents can never have seen this most lovely plant thrive as it does at Bessborough.

The present gardener, Mr. TOMALIN, who wrote the article alluded to above, speaking of its spreading habit, says: "Eight years ago our plant was 6 feet across, now it extends for 33 feet along a border, 3 feet wide, at the foot of the terrace wall facing south-west. The soil is very light, and the border often becomes extremely dry in the summer without any apparent ill effect on the plant. The offsets, which appear to be root-suckers, have come up a distance of from 3 to 6 feet from the parent plant. These offsets exceed the parent plant in vigour, some of them being nearly 7 feet high."

In the pleasure-grounds, and practically dividing these from the kitchen-garden, is the lake, which adds greatly to the beauties of Bessborough, and Irish yews stand like sentinels along the side of the lake.

Though the outdoor gardens were the main features of Bessborough, indoor plants were also well grown, including that lovely Lily, *Eucharis amazonica*, which was illustrated in *The Garden* in January 1901.

From Bessborough, which is on the Kilkenny side of the River Suir, it is but a few miles across the river to Curraghmore, the seat of the Marquis of WATERFORD.

Curraghmore is a princely domain extending for many miles over hill and dale, and very fine specimen conifers, as well as native trees, are to be found in the pleasure-grounds and woods surrounding the mansion. A mountain stream runs through the park and a fine sheet of water lies in front of the house, the overflow from this providing a stream flowing through the pleasure grounds, the banks of this stream being planted with many waterside plants.

Among the features of Curraghmore are its *Rhododendrons*, of which there are literally miles, and in the flowering season they are a sight which brings many visitors from the neighbouring city of Waterford. To speak of a specimen of *Rhododendron Broughioniana* 25 feet through amply illustrates how these thrive at Curraghmore.

Amongst the famous gardens of Ireland of thirty or forty years ago, Woodstock in Co. Kilkenny was considered one of the first. Splendid specimens of *Pinus insignis* and other conifers abound in the pleasure-grounds; but the great feature of Woodstock was its magnificent rock-and-water garden, which at the time I visited it impressed me as one of the grandest rock-gardens I had ever seen. I do not mean a rock-garden filled with tiny choice alpine, but large groups of plants thoroughly at home. For instance, I remember seeing huge clumps of the Royal Fern, *Osmunda regalis*, over 6 feet in height.

Another feature at Woodstock was the famous old Dutch Garden.

Not very far distant from Woodstock, and in the same lovely valley of the Noire, is Mount Juliet. The "silvery Noire," as it is often called, is famous for its trout and salmon fishing.

Mount Juliet formerly belonged to the Earls of Carrick, a branch of the famous Butler family. It is about eleven miles from Kilkenny, and now belongs to General MCCALMONT, who has restored the place to more than its former splendour, and has made the gardens amongst the best kept in Ireland. The kitchen-garden alone is six and a half acres in extent, and has now the largest variety of fruit trees of any private garden in Ireland. But the main feature of the place is a fine rock-garden, which is laid out in an open field. Round the rockery proper are clumps of many herbaceous and bulbous plants. The rockery has a never-failing stream running right through its centre, which adds greatly to its charm, and all lime-loving plants thrive exceedingly well. The rose-garden is surrounded by high walls. The herbaceous borders and its walks are paved with stone slabs, with some of the smaller Sedums, Thymes, and similar creeping plants planted in the crevices.

A garden justly famous in Ireland twenty years ago was the late Countess of KENMARE'S garden at Killarney. The mansion was entirely destroyed by fire some years ago. Perhaps the finest features of the gardens here are the magnificent hedges, both of Yew and *Cupressus macrocarpa*.

The Lily garden shows a beautiful combination of garden, parkland, lake, mountain, and wood, which caused a famous General, who had travelled the world over, to remark that it was "a combination not to be equalled anywhere in the world."

Hybrid perpetual roses were not a success in these gardens, but China roses were magnificent. Such plants as bamboos revel in the moist atmosphere of Killarney, practically all varieties succeeding admirably, *Arundinaria nobilis* growing 20 feet high in five years from home-saved seed.

Derreen.—The Marquis of LANSDOWNE'S place in Co. Kerry is situated right on the sea coast of Ireland. Though I have not been fortunate enough to visit Derreen, I have had charming accounts of the almost tropical vegetation which abounds there, and, naturally, such plants as bamboos and the choicer conifers do exceptionally well.

The dimensions of some of the latter are very large. This is not surprising in view of the warm and humid atmospheric conditions. The rainfall averages 80 inches a year. In 1914 it measured over 94 inches. This amount of moisture combined with a light peaty soil gives excellent conditions for vegetation, but not exactly what most of us would choose to live in all the year round.

I am not able to illustrate the fine specimen trees and shrubs growing at Derreen, but Mr. ARROWSMITH, the present gardener,

has kindly furnished me with the measurements of some of the more noteworthy.

Cupressus macrocarpa, height 76 feet ; circumference of trunk 15 feet 7 inches ; extreme spread of branches 82 feet 6 inches. This was planted about fifty-five years ago, and is reputed to be the largest in the British Isles.

Pinus insignis, height 81 feet ; circumference 10 feet 6 inches.

Douglas fir, height 82 feet ; circumference 8 feet 3 inches.

Abies Nordmanniana, height 70 feet, and 33 feet through.

These are all well-furnished specimens, with branches right to the ground.

There is a very curious specimen of Larch to be seen. It is like an enlarged Japanese dwarf tree, the roots being probably cramped in the rocks ; height 37 feet ; circumference of trunk 8 feet 5 inches ; spread of branches 75 feet.

Eucalyptus Globulus, height 70 feet ; circumference 7 feet 6 inches. Flowers regularly.

Acacia dealbata, height 59 feet ; circumference 7 feet 5½ inches.

Cornus capitata, height 34 feet ; spread 29 feet 6 inches.

Eugenia apiculata, height 31 feet 6 inches ; spread 22 feet. This specimen has ten stems, very beautiful when in flower. Beneath it and around are hundreds of self-sown seedlings.

Chamaecrops excelsa, height 20 feet.

Cordylina indivisa, height 30 feet ; circumference 3 feet 6 inches.

Azara microphylla, height 33 feet ; spread 22 feet.

Olearia Forsteri, height 16 feet ; 26 feet through.

Olearia macrodonta, height 12 feet ; 14 feet through.

Griselinia littoralis, height 20 feet ; 16 feet through.

Desfontainea spinosa, height 10 feet ; 18 feet through. This flowers well here.

Embothrium coccineum, height 14 feet ; 12 feet through. (I noticed recently that in *Nicholson's Dictionary* the height of this plant is given as 3 feet.)

Aralia Sieboldii, height 10 feet ; 18 feet through.

Arbutus Unedo, height 30 feet ; 28 feet through.

Drimys Winteri, height 12 feet ; 22 feet through.

Andromeda formosa, height 12 feet ; 10 feet through.

One holly is quite a giant of its kind, and is 40 feet high ; circumference, 5 feet 8 inches. All stem measurements are taken at 4 feet from ground. Mr. ARROWSMITH writes : " We have a large collection of *Rhododendrons*, which do remarkably well here, and make a superb show when in flower. Greenhouse varieties are also doing well in the open air, such as ' Countess of Haddington,' ' Fragrantissima,' and ' Princess Alice.' Some of the older varieties, such as ' Nobleanum,' ' Coccineum,' and ' Puniceum ' make bushes 40 feet high and as much through, with main stems 3 feet in circumference. Besides the usual garden varieties, we have also many of Wilson's introductions from China.

Bamboos grow luxuriantly; we have about twenty-six varieties, and some very large clumps of *Arundinaria aristata* contain several hundred canes. One grubbed out last year contained over six hundred canes, many of which were 26 feet long.

A. racemosa has canes over 27 feet long.

A fine piece of *Phyllostachys nigra* is usually much admired here. It has canes 20 feet high and jet black and is very striking.

Phormium tenax and its varieties all grow freely here near the sea. Escallonias, under such conditions, make capital hedges—one near the sea is 65 yards long, 10 feet high and 10 feet through.

Fuchsia Riccartoni grows everywhere, and the dwelling-house is almost covered with it. We clip it with the shears in the early spring, and then let it run to flower as it pleases. It takes a thirty-rung ladder to reach the top of the plants. In another garden we have two hedges of this Fuchsia each about 100 feet long; these look very well in the summer. Tree ferns thrive and look very ornamental in a dell. *Gunnera manicata* makes bold clumps and enormous leaves, the latter often more than 6 feet across.

Other choice shrubs that do well here are *Leptospermum scoparium*, *L. Nicholsii*, and *L. Chapmani*, *Olearia semidentata*, *O. chathamica* and *O. macrodonta*. In late summer and autumn Hydrangeas make a good show, the majority being of a beautiful blue shade.

Kilruddery, the seat of the Earl of MEATH, is situated near the fashionable seaside resort of Bray.

The estate is of great antiquity, having been a monastery connected with the Abbey of St. Thomas the Martyr. Kilruddery is derived from two Irish words meaning "The Church of the Knight."

On the suppression of the monasteries by King HENRY VIII. the demesne was presented to Sir WILLIAM BRABAZON, a distinguished warrior of Anglo-Saxon lineage, and ancestor of the present owner.

Many interesting remains of the monkish period are still discernable, although the ancient buildings have disappeared, the most noteworthy of these remains being the portion of the grounds known as the Angles—a number of triangular areas divided and enclosed by high hedges of Yew and Hornbeam, kept neatly trimmed, which local tradition says were used by the monks for solitary meditation. The present pleasure-grounds are extensive, comprising some thirty acres of woodland, lawn, and flower garden. The latter is laid out in the Italian style of intricate design, and extend from near the large conservatory to the kitchen-garden.

The conservatory is a large oval-shaped building, and, besides the usual tree-ferns, palms, orange and lemon trees, contains some very fine specimens of the sculptor's art. There is no lack of water at Kilruddery—four large ponds besides small streams existing.

Three of the ponds have a special interest. The two known as the Long Ponds were in the time of the monks used as fishponds, and doubtless many a good catch helped to furnish the larder of the monks on fast-days.

The third pond is of circular design, containing a fountain with an arrangement of jets playing into it, and is enclosed by a circular beech hedge 30 feet in height and 18 feet through—with a passage about 7 feet wide and 10 feet high running all round in the middle of the hedge.

Near by, The Sylvan Theatre is an interesting link with mediæval times. The theatre, which is enclosed by a bay hedge on three sides, and opens on the fourth for the players, has seats cut in the slopes for the audience, and was the scene of the first performance in Ireland of Milton's "Comus."

In the woodlands many fine specimen trees may be seen, amongst them *Pinus insignis*, *P. sylvestris*, and *Cedrus atlantica*, with Ash, Beech, Oak, and other native species in profusion.

A fine old grove of evergreen oaks, some 75 feet high—many of the trees with a girth of 9 to 11 feet round the stem at 5 feet up—planted about 350 years ago, is on one side of the bowling green which doubtless was used by the monks for recreative purposes.

Not many miles from Kilruddery is Powerscourt in Co. Wicklow, where the finest views are to be seen from any garden in the world. It possesses splendid specimens of conifers and a very fine specimen of *Fagus betuloides*.

Any paper on "Irish Gardens" would be incomplete without reference to Glasnevin, which is 50 acres in extent, and in some respects is one of the finest Botanic Gardens in the world. In passing I may say that I am indebted to Sir FREDERICK MOORE for the notes on this most interesting public garden, and also for the notes on other gardens which I have not been privileged to see, but which he has—and, as you are doubtless well aware, no better authority on all matters appertaining to horticulture in Ireland exists than Sir F. MOORE. He says with reference to Glasnevin:—

"Some of the collections are exceedingly strong, in spite of the fact that the soil is very poor, being a shallow gravelly loam, on limestone gravel, and in many seasons suffering greatly from drought. The chief features are the water-garden, the herbaceous borders, and the rock-garden, and indoors the collection of species of orchids which is believed to be the best in the world—even better than the collection at Kew.

The collections of Cycads and succulent plants are well known, and both are good, though in this respect Kew is undoubtedly first.

Of other interesting gardens in Ireland, Lord Barrymore's place at Fota Island, Queenstown, is one of the very first. Unfortunately, I have no photographs of the many marvellous things growing in the gardens there.

The vegetation on Fota Island is almost tropical, and it is quite a distinct type of garden; and, again quoting Sir FREDERICK MOORE, "the collection has been kept up, and probably stands first in Ireland."

Castlewellan, in Co. Down, is also well known to many garden-lovers, and, at the time I visited it about sixteen years ago, was at its zenith. It had at that time the most complete and the best-grown collection of trees and shrubs to be seen in any private garden in the world, these being quite a revelation to the average visitor. One striking criticism I heard a great gardener make was that it was "too much like a museum;" nevertheless, the many specimen trees and shrubs were marvellous and worth a long journey to see.

Kilmacurragh, in Co. Wicklow, belongs to Mrs. BALL ACTON, and is certainly one of the very best gardens of its type. There are the finest specimens of species of *Rhododendrons* in Ireland growing there, and some of the rarer coniferæ are well grown. The finest tree of *Embothrium coccineum* is probably the specimen in this garden, and the garden generally is one of great interest. A specimen of *Abies grandis*, over 100 feet high, was blown down a year or two ago.

Mount Usher is another famous Wicklow garden, though on a totally different scale, and there are few garden visitors to Ireland who do not know of Mount Usher, with its streams and wonderful climate. All classes of plants are represented, and it has a splendid collection, including very fine specimens of *Eucalyptus*.

Mr. E. H. WALPOLE, the owner of Mount Usher, to whom I am indebted for photographs, says: "The house is an old mill-house which was taken by my grandfather in 1860, and the place has been worked up as a garden by my late father and uncle."

The place lies in the valley of the Vartry and is very well sheltered from most winds. The climate and soil are both exceptionally good and suitable for many classes of plants.

Old Conna Hill, Bray, belonging to Captain RIALL, is another very good garden where tender plants do remarkably well. Here *Cantua dependens* has lived for many years on a wall, and flowers freely. "There," says Sir F. MOORE, "is the finest plant of *Dendromecon rigidum* I have ever seen, it makes shoots 15 feet long in one year, and is rarely out of flower."

I should say the best general collection of trees and shrubs (but mostly young) are in Sir JOHN ROSS OF BLADENBURG's garden at Rostrevor House, Rostrevor. It has a wonderful climate, and the soil is open, stony, and free of lime. It is sheltered by a hill from the sea winds, and such plants as all the species of *Leptospermum* flourish. *Prostanthera lasianthos* is a bush 50 feet high and unprotected for years. There is a most complete collection of *Eucalyptus*. *Embothrium* is splendid, and many rare plants usually grown indoors flourish. *Hakeas*, *Banksias*, *Acacias*, several *Agaves*, *Aloes*, and *Crassulas* live out unprotected. Tree-ferns also live here, and a great variety of plants which one does not expect to see in the open air

are found in this garden. Sir JOHN ROSS is an enthusiastic collector, and has made this garden celebrated. He has really made the garden in the last quarter of a century.

Mr. BEAMISH'S garden at Ashbourne in Co. Cork is another garden of the Mount Usher type.

The rock-garden there is good, and many features are better than one sees in many places.

A garden on similar lines is that of Mr. H. D. BARTON in Antrim. Here *Primulas* and *Meconopsis* grow better than I have seen them in any place in Ireland, and the collection of alpinists is not only good but extremely well grown. It is a garden everyone should see.

Also on the same lines is Mr. H. BLAND'S garden at Blandsford, Abbeyleix, Queen's County; but, in addition to the alpinists, a very complete collection of conifers has been made, and a collection of hard woods is now being formed. A very complete collection of alpinists grown in a most original way—mostly on mounds made of heaps of peat carted direct from the bogs—is that of Mr. MURRAY HORNIBROOK at Knapton, Abbeyleix. Mr. HORNIBROOK is a well-known authority on *Saxifragas* and *Campanulas*, and he not only knows them well, but grows them well.

Sir F. MOORE says: "I have sent several people to see this garden, and they have all come back delighted with it, and with the work done there."

In pre-war days Mrs. GREEN'S garden at Curraghgrange, Co. Kildare, was also a well-known and extremely well-done alpine garden. In fact, it was a garden that should not be missed, though the climate there is much harsher than in any of the other gardens named, except the Abbeyleix gardens, and therefore many of the tender plants characteristic of Irish gardens are not found there. It is curious that both in Co. Antrim and Co. Down many very tender plants do well.

I am sure that to many, who have not seen the more tender plants growing in the open air in the gardens in Ireland as I have seen them, some of the figures quoted, and the dimensions given, will appear almost incredible. The fact remains that the garden-lover will be well repaid by making a pilgrimage to Ireland. It will open his eyes to many things. We are very apt to think over here that they do not know how to do things in Ireland, which is very far from being the case; but especially he will find that the Irishman or Irishwoman gardener and garden-lover is amongst the most enthusiastic in the world. They also are quite as famous for their hospitality, and every visitor is made to feel that he or she is an honoured guest, and everything possible is done to make the visit a most enjoyable one, and even worth the journey across the Irish Channel in bad weather.

SUGGESTIONS FOR THE RIGHT SELECTION OF
APPLE STOCKS.

By RONALD G. HATTON, M.A., Director, Wye College Fruit
Experiment Station, East Malling.

[Read September 23, 1919; Mr. J. HUDSON, V.M.H., in the Chair.]

DURING the past two and a half years several reports have appeared, from both Bristol and East Malling, on the subject of Free and Paradise Apple Stocks. The reports of the researches carried out are to be found in the JOURNAL of the R.H.S., vol. xlii. p. 361, and vol. xlv. p. 89, in the Bristol Annual Report for 1917, and in the special pamphlet on Paradise Stocks issued from East Malling in January 1919 and widely published in the weekly fruit papers.

Probably a stage has been reached which will necessitate a waiting period before any further pronouncements can be made as to the ultimate value and influence of individual types of root system, because we are now bound to wait for the verdict of fruiting trees upon various soils. These trees are yet in their infancy.

However, the first stages of the work have shown so conclusively the vital influence of a good or bad root-stock that the matter cannot be allowed to rest for the next five years until these final tests have yielded up their results. The questions are, What can be done meanwhile to make the best use of the knowledge available with regard to apple stocks? and, How can we begin to put our stool beds in order? There are very many definite indications of the value of different types of stock at the present moment, of which a good deal of use can be made at once. It is the purpose of this paper briefly to state the present position, and to outline those indications which are sufficiently constant to form a basis for judgment.

The Popular Idea.—The first essential is to disabuse ourselves of the popular or text-book conception of apple stocks. Those who handled hundreds of thousands of stocks must have realized the incompleteness of the conception, though their catalogues gave little hint of it. In the popular mind apple stocks were of three types:

1. Paradise or dwarfing stocks with fibrous and surface roots. These were raised by layers, and were suitable only for bush and garden-trained trees.
2. Free or strong-growing stocks raised from seedlings of various sorts, mere chance crosses, suitable for standard trees and weak-growing varieties.
3. Crab stocks raised either from pips or suckers of the 'True Wild Crab,' supposed to be especially hardy and suited to the same purposes

as the free stocks. Both the free and crab stocks were reckoned to be deeper and coarser rooted than the Paradise.

The Result of Investigations on the Paradise.—The investigation carried out at East Malling showed, in the first place, that there were eight or nine types of so-called Paradise in fairly general use in this country. It proved that these types varied very greatly in vigour from the true Broad-leaved English Paradise, upon which I have seen standard trees as strong and vigorous as upon any free stock, to the true French Paradise which forces Bramley's Seedling in the second year from the graft into copious fruiting. Incidentally, it showed that the strong and weak types were frequently badly intermixed, and that the names were interchangeable and inaccurate.

The investigations also disclosed a series of so-called Paradise stocks more vigorous even than the true Broad-leaved, and, in fact, as deep and coarse-rooting as a good free stock, yet easy to raise vegetatively from layers. It also became apparent that the more dwarfing stocks were often very sparsely furnished with root fibre and were even coarse-rooted, as is the case with the true Doucin or English Paradise, and that some of the deeper-rooting stocks, such as Type III., were nearly as dwarfing as the most surface-rooting ones, such as Type IV. The ample root-fibre of Broad Leaf and Nonsuch Paradise has tended to induce greater vigour than the coarser lateral roots of the Doucin. In other words, there appears to be no direct correlation between free fibrous-rooting and dwarf growth.

Results of Investigations on the Free and Crab Stocks.—The work carried out upon the classification of the free and crab stocks at Bristol showed that there was no marked distinction between these two trade divisions in root characters. It demonstrated that even at an early stage in the life of seedling stocks root differences became apparent, and that as they developed a wide range of root systems showed itself amongst the free and crab stocks.

The stocks fell into nine main groups, varying from

"A. A mass of fine fibrous roots, practically no coarse roots, and stem usually distinctly dwarfed."

through a series of groups, of which one of the most characteristic is

"F. Numerous strong horizontal laterals with fair amount of fibre, and strong growth of stem."

to the other extreme from A, as represented in group

"J. Original root system persistent, little adventitious rooting, and (a) stem strong, (b) stem dwarfed."

In other words, the range of root system in Paradise and Free stocks is almost the same. Free stock is a comprehensive term, meaning no more than seedlings which include dwarf stocks both

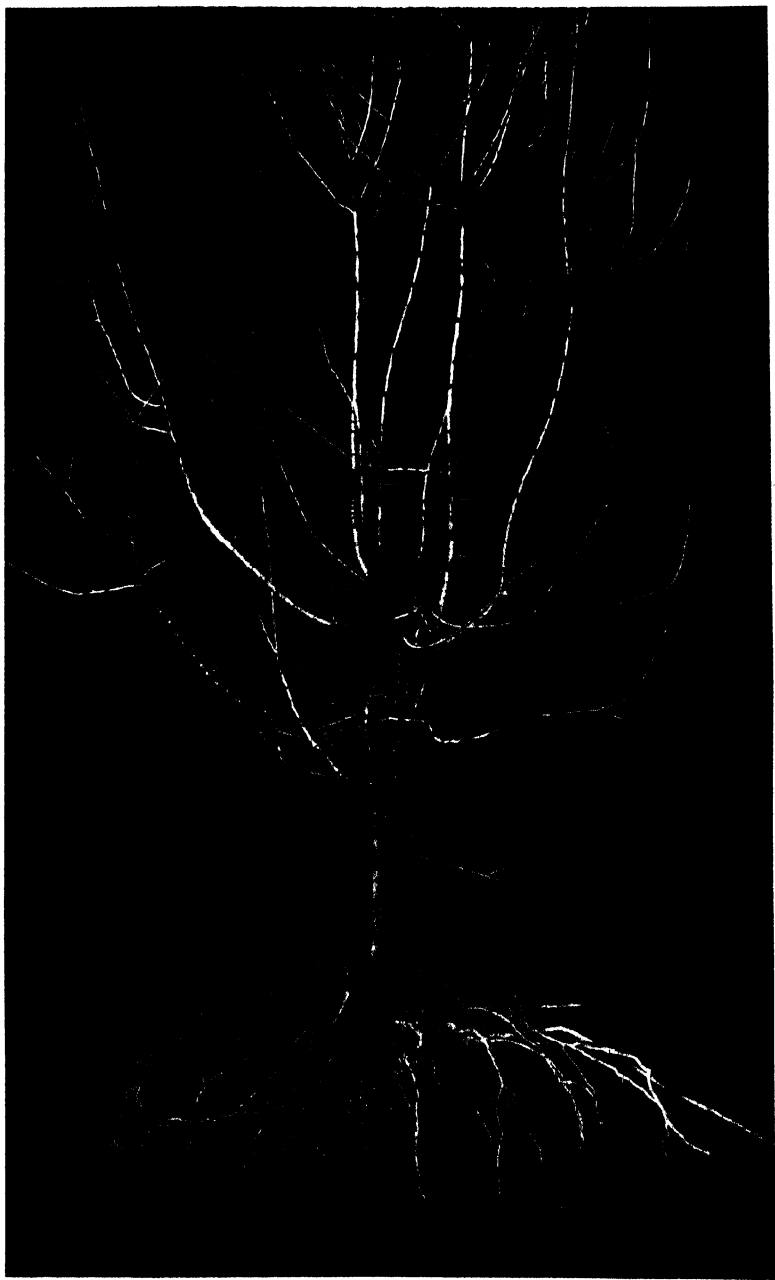


FIG. 46.—CRAB STOCK, TYPE A.
(7 years old.)

Height, 11 feet 4 inches ; girth, 8 $\frac{3}{4}$ inches.

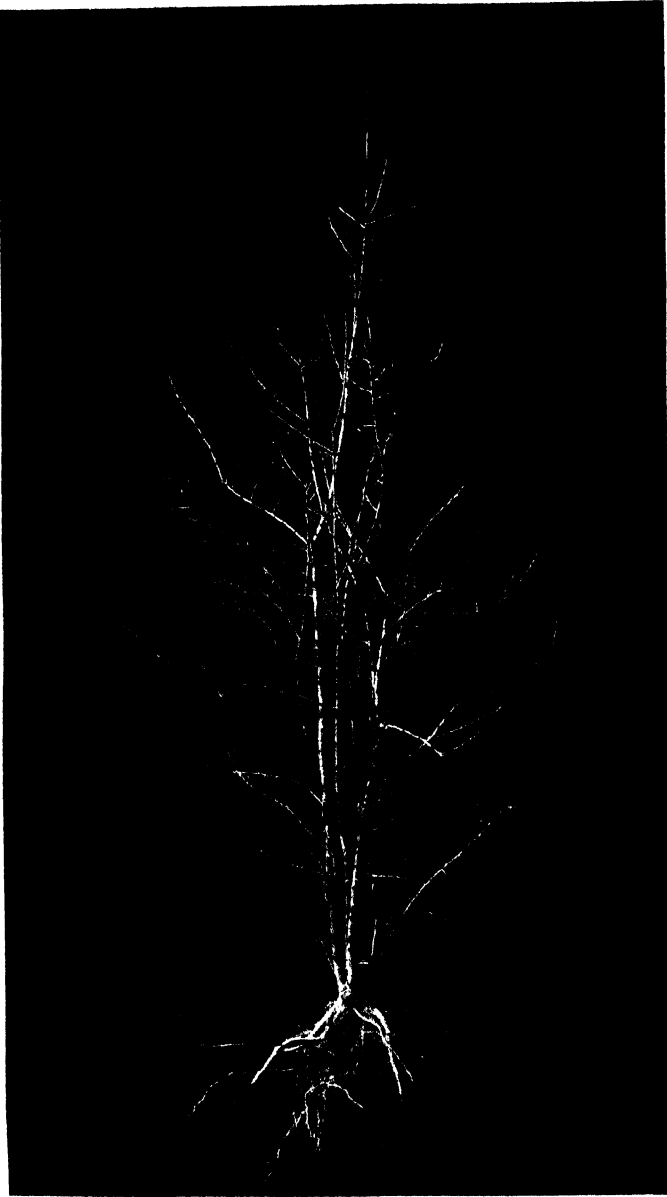


FIG. 47.—CRAB STOCK, TYPE B.
(7 years old.)
Compare vigour with A.



FIG. 48. CRAB STOCK, TYPE C.
(7 years old.)

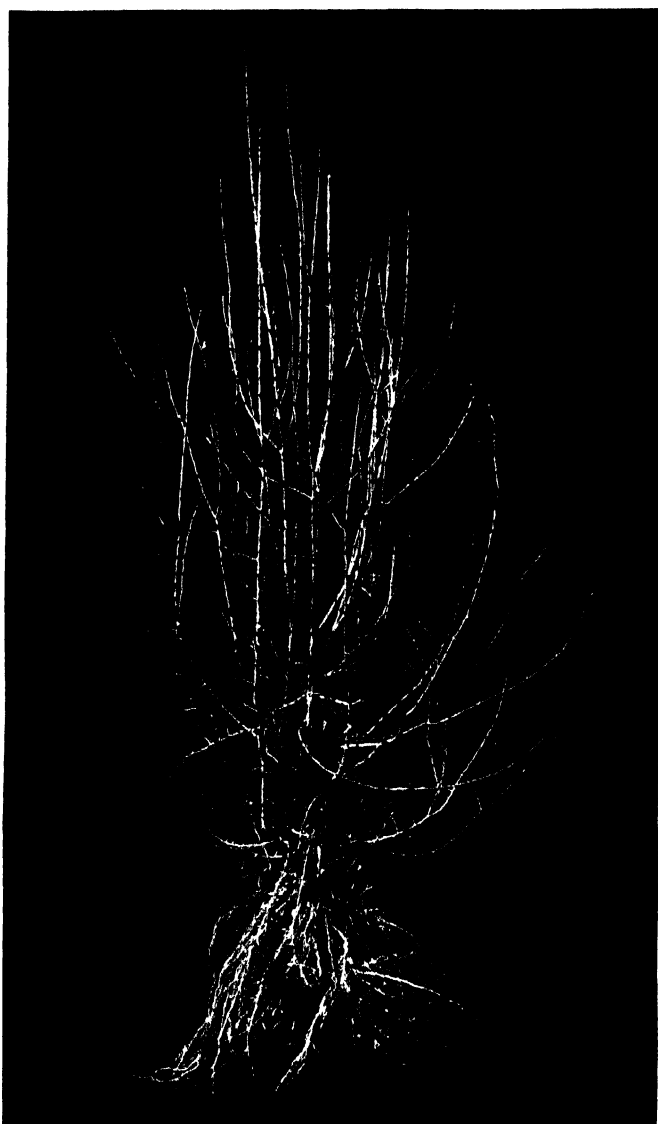


FIG. 49. —CRAB STOCK, TYPE E.
(7 years old.)

Note fibrous roots and rooted branchlets as in Paradise types.

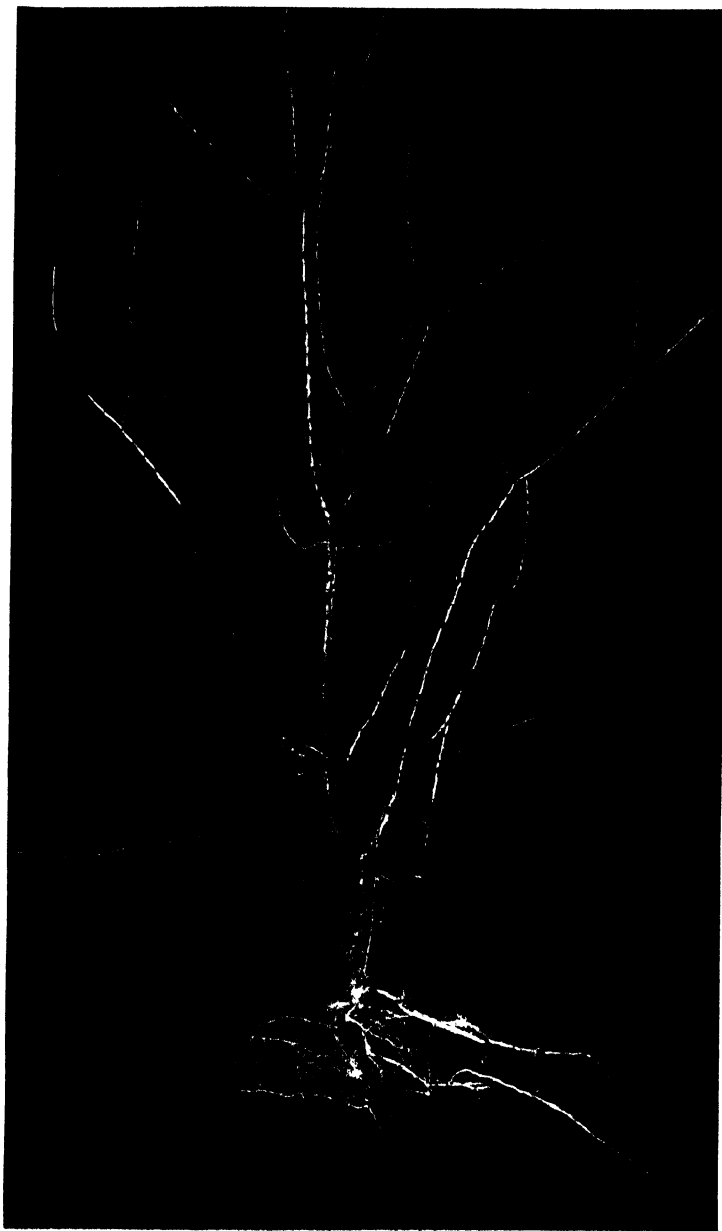


FIG. 50. CRAB STOCK, TYPE F.
(7 years old.)

Note 'Burr Knots' on stem. It layers readily.

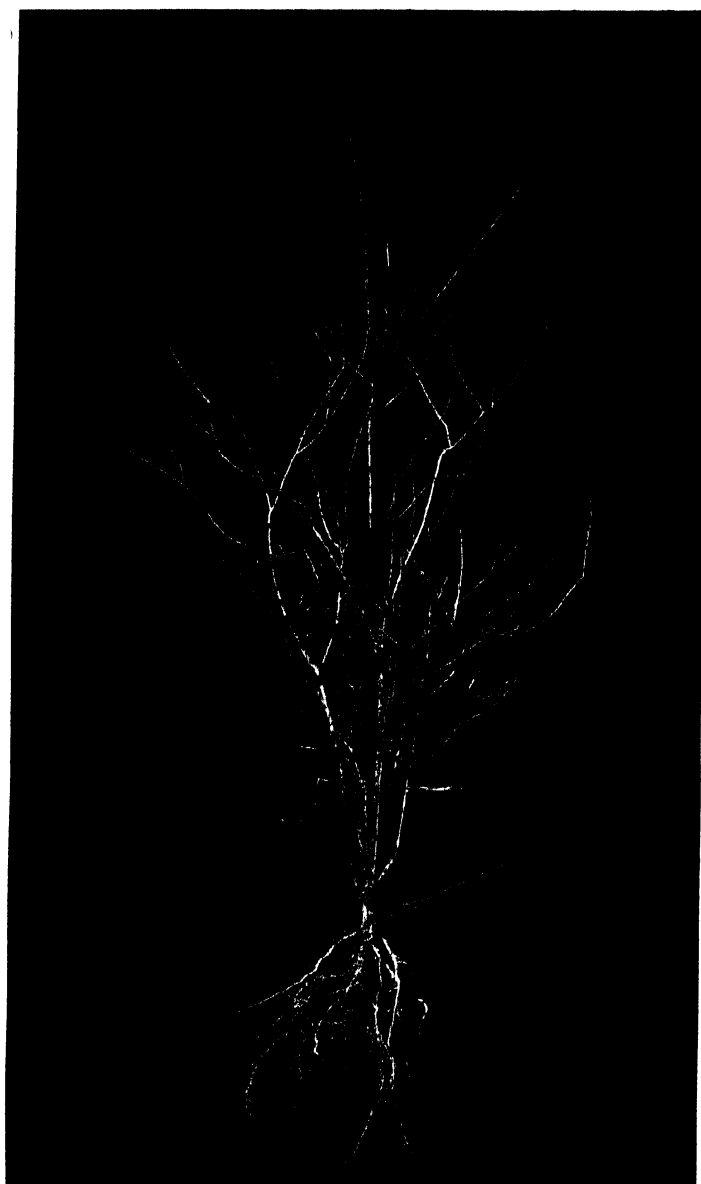


FIG. 51. - CRAB STOCK, TYPE G.
(7 years old.)

Compare vigour with A. Note 'Burr Knots' on stem.

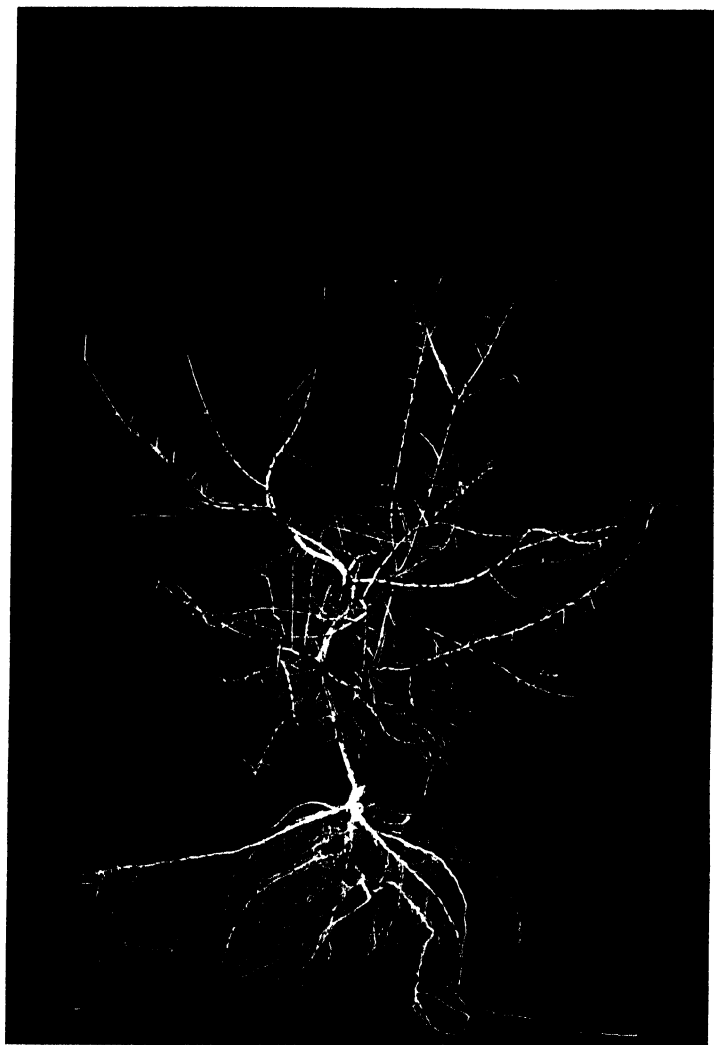


FIG. 52.- CRAB STOCK, TYPE II.
(7 years old.)

A common thorny type to be found in beds of crabs. Deep and fangy rooted, yet very dwarfing.



FIG. 53.—CRAB STOCK, TYPE J.
(7 years old.)

Height, 4 feet 11 inches ; girth, $4\frac{1}{2}$ inches. Compare with A. Note
“Burr Knots” and fibrous rooting, typical of a very dwarf Paradise.

fibrous and stump-rooted, as well as vigorous ones resulting from a well-balanced root system.

Meanwhile, very careful investigations were being made at East Malling with regard to the relative vigour of Free, Crab, and Paradise stocks, and the range of growth and root system included in each class. The results of this particular part of our work have not hitherto been publicly recorded, therefore I wish to dwell shortly upon these experiments, as they are complementary both of our own previous work on Paradise stock and of the free-stock work at Bristol.

Trials at East Malling of the Relative Vigour of Free and Paradise Stocks.—Selected types of Paradise, ranging from the dwarf Type IV. to the very vigorous Type XIII., all raised vegetatively from layers, were planted out on their own roots to demonstrate their relative vigour. To this collection I shall return later.

A year prior to this, in November 1913, Captain WELLINGTON and myself went very carefully through a considerable bed of so-called crab stocks obtained from a foreign source through an English nurseryman in 1912. It was noted that when these seedlings, mostly two-year olds, were planted out, they appeared to be very even, and the majority exhibited a tap-rooting tendency. When they were planted out at Wye in 1912 these tap-roots were, of course, trimmed back at the time of planting.

At the first inspection a year after planting, we noted the bed as generally very free-growing and clean-stemmed at the base. A large number had bold broad leaves, with red petioles, stout wood, and prominent buds, which we remarked as somewhat resembling 'Beauty of Bath.' Only a very few appeared stunted and spiny at the time. It is interesting to note that in the normal course of events at this point such a bed of stocks would have been "worked" before anything more was known about it, hence the common impression among many tree-raisers that free and crab stocks vary little. Few nurserymen have had time or inclination to grow on such a bed of stocks for seven years to see what it revealed.

We proceeded, however, to select out certain typical ones. These were transferred to East Malling, and were planted out in February 1914 to grow on on their own roots, which they did until March 1919, when they were lifted in order to obtain the present series of photographs of their relative growth and rooting characters. A period of five years was thus allowed to elapse, the stocks being about eight years from the seed. The series of photographs, showing the trees taken to scale, is in itself striking enough in its illustration and proof of the immense variation in vigour amongst so-called free or crab stocks. However, to show that the difference is not very apparent in the early stages, I will give the original descriptive notes made of the stocks at the time of their selection in 1913, and at their examination in 1919. *

*November 1913.**March 1919.*

- A.* In leaf and wood colour very similar to 'Beauty of Bath.' Roots very fibrous. The strongest of the series. Height, 11 ft. 4 in.; girth, $8\frac{3}{4}$ in. Roots very strong and well balanced, giving good anchorage. Many strong, coarse, lateral roots in two whorls. Those at base of stem having downward tendency. Strong laterals above these, very spreading and well fibred. (Fig. 46.)
- B.* In leaf and wood similar to Nonsuch Paradise. Roots more thongy than *A* and less fibrous. Root knots very evident on stem. The fifth in vigour. Height, 9 ft. 8 in.; girth, $3\frac{1}{2}$ in. Few straight lateral roots, tending to grow downwards. Upper laterals strong, moderately fibred, other laterals more in nature of fibre. (Fig. 47.)
- C.* In leaf and wood similar to *A*. More deep rooting, very strong and thongy. Few fibres. Second in vigour. Height, 10 ft. 10 in.; girth, $7\frac{1}{2}$ in. Roots well balanced, many very small laterals; those at base with downward tendency, those above spreading. Laterals not very well fibred. (Fig. 48.)
- E.* In leaf and wood similar to *A*. Roots thongy and long. Very fibrous at base and stem. Root knots present on stem. Fourth in vigour. Height, 9 ft.; girth, 8 in. Strong lateral roots, tending obliquely downward. Strongest laterals not well fibred; numerous other medium laterals possess abundance of fibre, borne in dense clusters. Much fibre at collar. (Fig. 49.)
- F.* Very similar to *E* in all characters. Third in vigour. Height, 10 ft. 4 in.; girth, $9\frac{1}{2}$ in. Roots not very strong in comparison to size of tree. Fewer laterals than *A* or *C*. One or two strong laterals poorly fibred, others moderately fibred. Long fibrous roots direct from stem. (Fig. 50.)
- G.* Similar to *E* and *F*. Root knots frequent on stem. Sixth in vigour. Height, 8 ft. 10 in.; girth, $6\frac{3}{4}$ in. Lateral roots few, moderately strong, poorly fibred. (Fig. 51.)

November 1913.

March 1919.

- H. A very thorny dwarf.** Dwarf, very spreading and spiny. Roots very many, thongy, deep rooting, sappy. Height, 5 ft. 2 in.; girth, $4\frac{1}{2}$ in. Many coarse lateral roots practically devoid of fibre, very spreading, a few with downward tendency. A few fine fibrous laterals. (Fig. 52.)
- J. Leaves and habit of growth similar to Non-such Paradise. Roots fibrous. Exceptional number of root knots.** Very dwarf. Height, 4 ft. 11 in.; girth, $4\frac{1}{2}$ in. Mass of fine lateral roots, none coarse, abundant fibre. (Fig. 53.)

Thus it will be seen that in a series of eight typical stocks chosen from a single bed of 'crabs,' the height varied between 11 ft. 4 in. and 4 ft. 11 in., and the girth between $9\frac{1}{2}$ in. and $3\frac{1}{2}$ in.

To all appearances two, or at most three, of the series would have been suitable for standard trees. It is interesting to note that the whole of this series can be, and actually have been, propagated vegetatively; in many cases with ease, but in others with comparative difficulty.

This experiment was not a solitary one, nor an isolated instance of particularly great variation, though it must be remembered that our original selection aimed at showing the very different types to be found in any bed of 'crabs.'

A second bed of 5,000 'true crabs' from the Continent—*Malus communis*--were carefully examined after four years' growth and revealed the same inequalities. After four years many stocks could still be whip-grafted, whilst others had to be rind-grafted with two or more scions. Within the last few days I have examined yet another bed of Continental 'crabs' at a younger stage, but it is comparatively easy to pick out strong and weak types.

A similar close examination was made of a collection of free stocks raised from the Pomace from a West Country orchard. We received 100 of these seedlings in March 1917. At the time of planting they were noted as very even; we thought probably they were selected stuff. These stocks were allowed to grow on until April 1919, and the whole batch were then carefully examined. Ninety-six were still living, and our examination of these revealed interesting characters of vigour, which may be tabulated as follows:

Tall . . .	43	Stout . . .	47
Medium . . .	39	Medium . . .	35
Dwarf . . .	14	Slender . . .	14
	96		96

In other words, rather over 14 per cent. appeared distinctly dwarfing and weak, though it may be conjectured that somewhere about

80 per cent. would have produced more or less vigorous standard trees.

The stocks were then very closely examined to discover how many of them showed root knots, and exhibited the possibility of easy vegetative propagation. The results were remarkable, and were tabulated as follows :—

Number of free stocks exhibiting adventitious roots :

Many knots	21
Medium number	27
Few	48
	96

At least 50 per cent. definitely exhibited this character, and many of those which showed it were of a vigorous and free-growing habit. The stocks were then roughly graded by their root systems into the Bristol groups. Representatives of all these groups except *A* were found, though the large majority fell in classes *C* (20), *F* (33), and *G* (16).

After examining the root systems and vigour of the stocks very carefully, my assistant, Mr. NORMAN GRUBB, M.S.A., prepared the following correlation table, which shows the relationship between vigour and depth of rooting to be very different from that which was popularly supposed in the past. Depth and shallowness of rooting do not necessarily in themselves denote vigour and dwarfingness any more than coarse or fibrous roots do.

Correlation Table for Strength of Growth and Depth of Roots.

		Roots very Shallow.	Shallow.	Inter- mediate.	Deep.	Very Deep.
Growth	very vigorous.	—	7	11	2	—
	vigorous	1	4	14	10	2
	medium	2	5	8	6	3
	weak	—	5	3	2	2
		3	21	36	20	7
		Total, 87.*				

During last week (September 15–20) I was privileged to examine a large collection of standard apple-trees of many varieties worked on free stocks from the identical source whence came our collection. The inequality of vigour in the stocks was most patent in the trees. Many were only suitable for cordons or bush-trees, whilst others of the same variety—often alternately placed—had made exceptionally fine standards both in height and girth.

Only this week a large nursery firm writes me :

“ We think you will agree that the seed sent out under the name

* The other nine stocks were not dug up, as they were selected for further propagation.

of *Malus communis* by Continental firms is no more nor less than hybrid apple seed, and thoroughly unsatisfactory."

It is often denied that this inequality in the stocks shows itself in the worked trees. Although it is true that a strong-growing variety, such as Bramley's Seedling, may largely obliterate this inequality in the maiden, differences again become apparent in the second and third years. I have rarely seen a bed of worked crabs with less than 5 per cent. obvious weaklings, whilst the percentage often runs much higher.

Whilst we have in mind this lack of uniformity in vigour of free stocks (raised as at present from chance seedlings), which must entail considerable loss to the tree-raiser and the tree-grower, it will be well to compare the collection of photographs taken of the series of selected Paradise (all raised vegetatively) already referred to. Though the trees are some eighteen months younger than the crab stocks which are illustrated, they are comparable in that they show a similar range of vigour and variety of root system. The series starts with the dwarf Type IV Paradise (fig. 54) comparable with the free stock *J* (fig. 53), and ends with the vigorous types of Paradise from Germany, of which Types X, XIII, and XVI show considerable promise as free stocks.

Note the deep-rooting habit of Type X. (fig. 59) especially, and the well-balanced system of coarse laterals and ample fibre so typical of the stronger free-growing stocks such as *A* and *C*. When we compare the two series, we realize that the old maxim that seedlings are always deep-rooted and layers always surface-rooted is a very imperfect one.

We have found it just as possible to raise stocks of deep anchorage by layers and other vegetative methods as it is easy to find shallow-rooted ones in any collection of free stocks raised from pips.

We are faced, then, with two converging series quite arbitrarily divided, the one ranging from dwarfness to vigour and the other from vigour to dwarfness; the only real distinction being that the Paradise series has been raised vegetatively, and any particular member of the series can be reproduced by that method again and again, whilst the free series has been raised from seed, and as long as this method is employed infinite variety and inequality will continue, except in rare instances.

It is often argued that 'true crabs' are less variable than 'ordinary free stocks,' but I cannot learn what the trade distinction stands for. If free stocks are the chance children of cider fruits, crabs* are the chance progeny of wildings; but every district has many so-called crabs varying in vigour and character. I have seen them strong and clean, dwarfing and root-knotted, whilst the types of fruits are various. I do not pretend to assert that free stocks from particular sources may not be more even than from other sources. That simply depends on the chance crosses, on the varieties mixed or

* In using the word "crab," I refer to the commercial trees, and not to definite botanical species which are unobtainable in quantity for nursery purposes.

cross-pollinated, which in some cases may be more advantageous than in others; but I do say that stocks raised from pips will always be variable, and therefore incompletely satisfactory, except for the purpose of raising new types of stock for subsequent vegetative propagation, if we find degeneration or imperfection in existing types.

Possible Present Action.—What, then, is the immediate solution both as regards Paradise and free stock?

First, with regard to Paradise. We are faced with an endless number of types from which to choose. If by Paradise we mean any stock raised from layers, we have isolated at least sixteen types at Malling, and could add daily to the series from every bed of seedling stocks. But I want it to be clearly understood that our object at East Malling is not to multiply the already over large and bewildering number—there are nine types already in frequent use in this country—but to select out three, or at most four, good types of stock capable of being raised vegetatively and of serving every purpose, from that of the garden cordon to that of the orchard standard grown in grass. Until the final trials of worked trees upon different soils, to which I have already made reference, have yielded up their results, I am not prepared to say more than what has already been said in other reports upon this special question of soil suitability; but now that we have had under review two considerable batches of young trees worked on the whole series of sixteen types, I am prepared to say something a little more definite upon certain other points.

In my leaflet on Propagation I have dealt with the advantages of each type individually for raising and working purposes, and I would only add here one further year's experience as to the pre-eminence of certain varieties in coming easily from hard wood and root cuttings, both of which matters are of considerable importance in these times of stock dearth. The present season has probably made most of us somewhat ashamed of our cutting beds; but my highest percentage of successes has been with the Broad-Leaved English Paradise, the Nonsuch Paradise, the dwarf Type IV and the strong Type XIII.

By root cuttings Types I, VI, IV, V, X, XIII, and XVI have come very successfully.

With regard to desirability for working purposes, one interesting fact was discovered during the grafting season of 1918, namely, that the "callus" is much quicker to form on certain types than on others—hence they get an earlier start into growth. It will be remembered that the grafting season was followed by a very hot May, which unfortunately started to melt the grafting wax which we had used uniformly. In certain cases the callus was still incomplete, and the melted wax found its way between the stock and scion with disastrous results. Trees worked on the Doucin or English Paradise (Type II) on Type IV (commonly used in Holland) and on Jaune de Metz Paradise (Type IX) suffered badly. The other types had fortunately all already united and did not suffer. We can also state quite definitely that upon our soil at any rate all the types will take the bud as well

as the graft. There is now every indication to show that the trees worked upon Broad-leaf (Type I), Nonsuch (Type VI), and Type VII will prove the most vigorous, probably in the above order. Of these Broad-leaf is undoubtedly the best anchored, and one is almost tempted to use it for standard work.

The Doucin or English Paradise is undoubtedly more dwarfing than Broad-leaf. This is already shown in the vigour of the young trees, as well as in the more obvious swelling at the union betwixt scion and stock, and I have little hesitation in saying that it will be more precocious in cropping than the Broad-leaf, and is therefore possibly better adapted for the purpose of temporary fillers. At the same time it is not so well anchored as the Broad-leaf, more apt to be caught by the wind and worked round in the soil, and therefore, I think, less suitable for very heavy-headed trees such as Bramley's Seedling. It seems to me that the Broad-leaf (Type I) and the Doucin or English Paradise (Type II) are so distinct in function that they are both likely to find a permanent place, the former especially, for permanent bush plantations and for weak-growing varieties, the latter for bush fillers, for the acceleration of cropping, and for more dwarfing purposes. Both appear to be excellently healthy stocks—such, at any rate, are the indications on our soil. So far no particular advantages are apparent either in Types VI or VII. The former is apt to be a coarse stock, and the latter, though vigorous, shows signs of a defective and poorly anchored root system.

Of the distinctly more dwarfing types, Types IV, V (Improved Doucin), and IX (Jaune de Metz), I think, are alone worthy of discussion. The continued and marked bad suckering habit of Type III, our 'Holly Leaf,' alone justifies one discarding it. At the moment I am concerned to see the high percentage of this stock, which has come into the country last autumn from abroad, mixed up with Doucin (English Paradise) and Type V (Improved Doucin). The True French Paradise (Type VIII), still unfortunately only too evident as a rogue amongst the imported Doucin stocks, has already yielded the most striking indications of the extreme possibilities of stock influence. The trees worked thereon are markedly more dwarfed than on any other type except the Jaune de Metz. All the varieties worked thereon—Bramley's Seedling, Lane's Prince Albert, and Worcester Pearmain—were thrown into considerable cropping in the second year from the graft—quite a remarkable sight. Were it not for the fact that this stock proves so unhealthy on our soil, it might have its uses. We have mentioned in previous reports the liability of the stock itself to canker in the nursery row. There is now a very striking indication of the danger of using inherently unhealthy stocks, for no less than 20 per cent. of the two-year-old trees worked on French Paradise have already developed canker seriously, especially markedly upon the Bramley's Seedling.

I should say that the Jaune de Metz Paradise (Type IX) will prove almost as dwarfing and precocious, and fortunately it has

a better constitution than the French, hence it may have a very special use.

It seems certain that either Type IV (the Holland stock) (fig. 54) or Type V (Improved Doucin) (fig. 56) would serve well as a dwarfing stock for garden purposes, especially for cordons.

A very complete series of Paradise would be made up by the selection of :

Type 1. Broad-leaf—for permanent bush-trees and weak-growing sorts.

Type II. Doucin or English Paradise—for bush fillers and general commercial dwarfing trees.

Type V. Amélioré or Improved Doucin—for cordons and garden trees.

Type IX. Jaune de Metz or Yellow Paradise—for extra precocity, probably useful on which to work new seedlings, pot trees, &c., to induce rapid maturity (fig. 55).

Such are, at any rate, the most marked and constant indications on our soil with regard to the definitely dwarfing types of stock.

Finally, I must say a word about the free-stock problem. We have seen that there is no distinct line betwixt free and Paradise. Each contains dwarfing and free-growing stocks, both of which are capable of vegetative propagation. By this latter means only can any particular type be kept true. If, then, we are to eliminate the patent inequalities in our plots of standards in the nursery and in the orchard, we must by some method standardize our free stock, instead of either burning a high percentage of culls or turning them into inferior cordons or bush-trees. There are three possible lines along which this standardization may proceed. In the present stock crisis it seems desirable that all three methods should be used.

1. Whilst seedling stocks are to be used they could be graded at an early stage, *i.e.* at the time of planting out, along the lines indicated in the Bristol Report on Free Stocks. It is probable that both their earliest groups and their final ones will produce dwarfing rather than free-growing stocks, and should therefore be discarded or used solely for dwarfing purposes. Our experience so far has demonstrated that a fairly high percentage of free stocks will fall in groups C, F, and G, apparently all more or less free-growing. It is impossible to grade these stocks from early vegetative characters alone with any degree of accuracy. The roots must be taken into account at the initial grading.

I am inclined to think that, in any case, this can be only a temporary and passing measure. All the same, it is worth initiating at once. And it could be followed up by a de-roguing of our free-stock beds of obvious weaklings before the budding and grafting season.

2. It is possible amongst our stronger types of so-called Paradise to pick out those, such as X (fig. 59), XIII (fig. 61), and XVI, with free-rooting and growth habit and deep anchorage, which appear identical with free stocks. Any of these types can be raised quickly

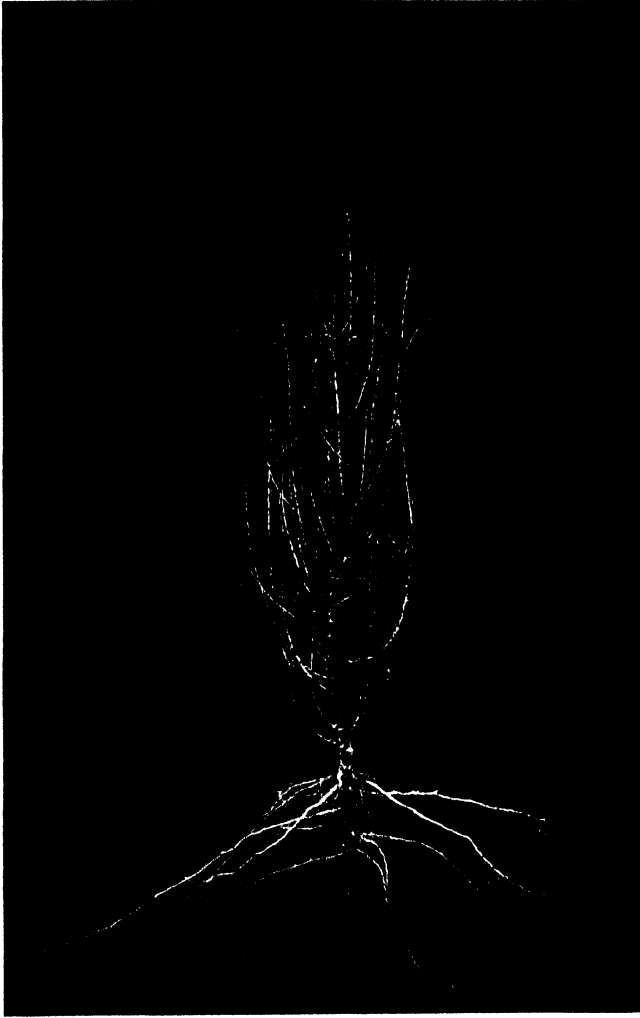


FIG. 54.—PARADISE STOCK, FOR COMPARISON WITH CRAB.
PARADISE TYPE IV (used in Holland).
(6 years old.)
Compare with Crab J.

[To face p. 260.

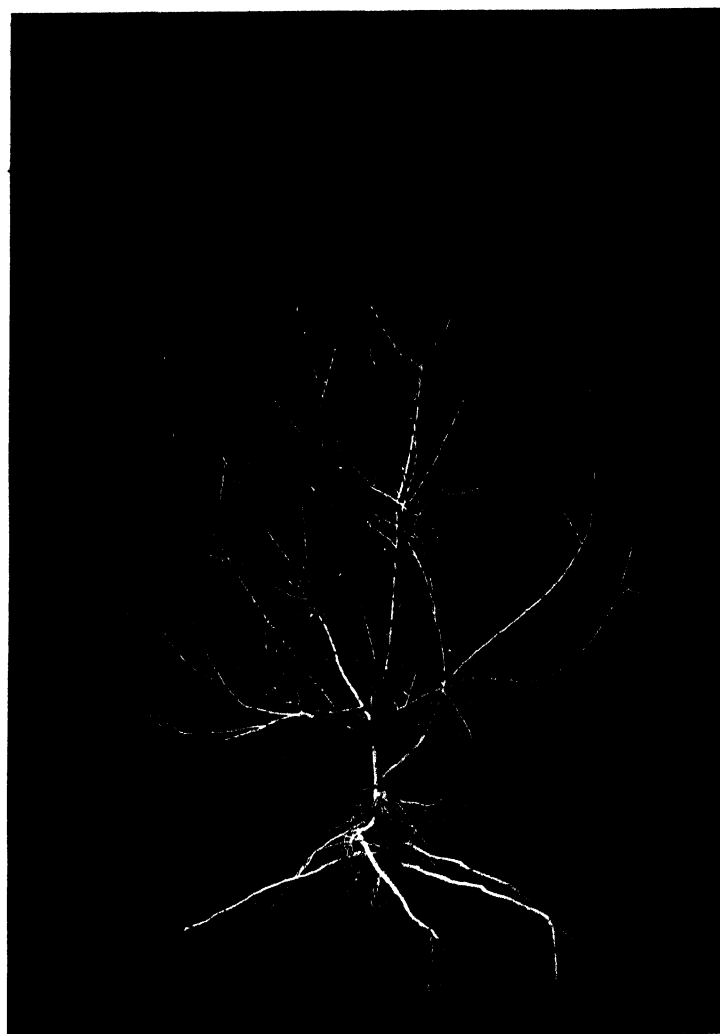


FIG. 55. PARADISE STOCK, TYPE IX (JAUNE DE METZ).
(6 years old.)
Compare with Crab II.



FIG. 56. PARADISE STOCK, TYPE V (IMPROVED DOFFIN).
(6 years old.)
Compare Crabs B and G.



FIG. 57.- PARADISE STOCK, TYPE II. DOUCIN OR ENGLISH PARADISE.
(6 years old.)

Compare coarse roots with fibrous Crab F.

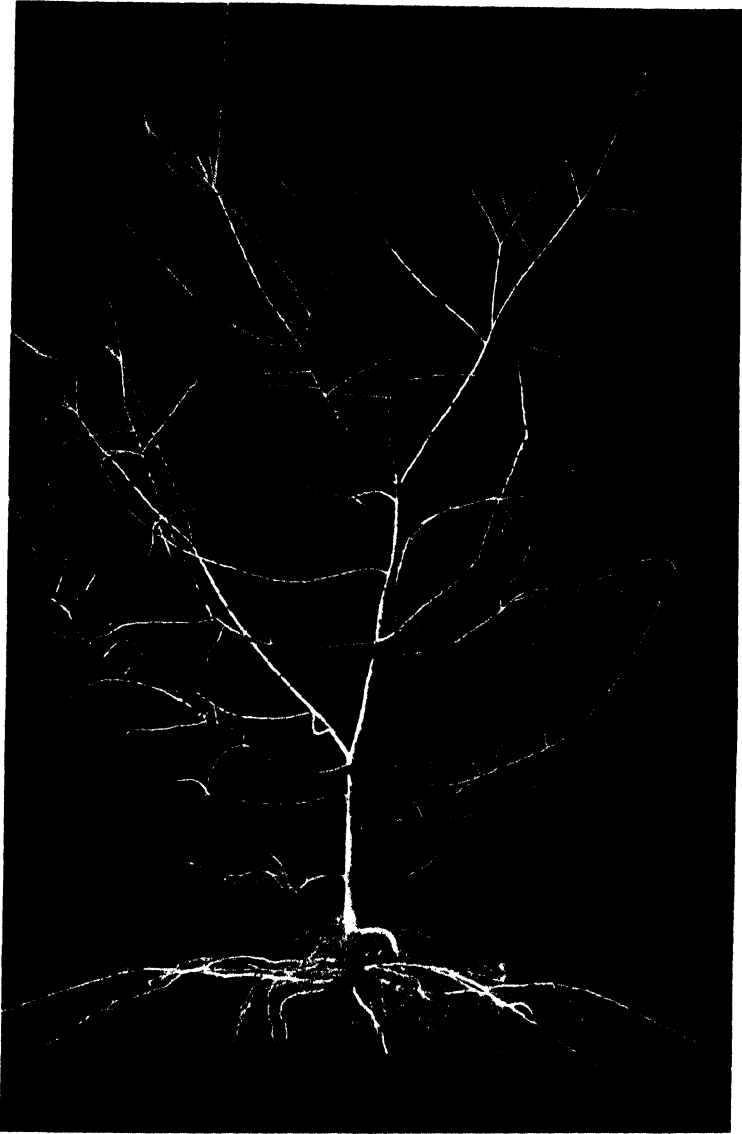


FIG. 58. — PARADISE STOCK, TYPE XIV.
(6 years old.)

A selected seedling. Note vigour, and compare with Crab F. It layers readily.



FIG. 59. PARADISE STOCK, TYPE X.
(6 years old.)

It layers readily. Compare depth and vigour of rooting with strong crabs.



FIG. 60.—PARADISE STOCK, TYPE XV.
(6 years old.)

Another selected seedling which layers readily. Note vigour and depth of rooting and compare with Crab A.



FIG. 61.—PARADISE STOCK, TYPE XIII.
(6 years old.)

Yet another selected seedling. Layers very readily.

by layers, wood and root cuttings, and could be used for standard purposes with comparative safety.

It is, of course, a long business to raise a large number of stocks from a few plants such as we possessed at East Malling; but we have never claimed that these particular stocks are the ultimate ideal for free stocks. We claim that they point the way to the right solution of the problem: the raising of free stocks vegetatively in order to obtain uniformity. It is possible to do this without permanently altering the fixed character of the root system.

I suggest that it is within the reach of every nurseryman to select from his free or crab stock beds one or more types which he fancies as free stocks, and which at the same time have indication—in the form of root knots—that they will readily root vegetatively. He can quickly work up a standard and uniform stock in this way if he is unable to obtain or does not like our stronger Paradise types, such as X, XIII, or XVI.

Out of my one hundred free stocks I picked out eight which looked like making good free stocks, and which at the same time looked as if they would layer readily; all of these have already actually rooted.

Such a movement for the selection and standardization by individual nurserymen of their own free stocks would be a great step forward both in their own interest and that of fruit-growers. The latter should give the former the necessary encouragement to induce them to take on this new responsibility and to give a guarantee that their trees are worked on definitely selected stocks of known origin. Ultimately, doubtless certain strains of free stock would prove pre-eminently desirable, and when they had been worked up in sufficient quantity they could be distributed over the whole country and general uniformity attained. Meanwhile local standardization could only tend to a better average quality of trees.

3. A third and quick method occurs to me as practical in the present stock emergency; that is, reproduction of the most promising sorts from root cuttings.

When the lifting season comes it is only too obvious in every bed of standards that certain individuals have done much better than others.

As these better trees are lifted and their roots trimmed, these root cuttings should be preserved and kept separate from the inferior ones. Very good stocks can quickly be obtained by this method, and a higher grade of stock would be aimed at. Such a method would, of course, need care and supervision.

I am confident that in the end both nurserymen and growers will welcome any method which will bring them a higher percentage of good and reliable trees on free-growing stocks. Until our experiments have gone further, I do not see that anything much more definite can be advised, but meanwhile acres are being planted up and we should aim at having these acres as well planted as possible.

We can be getting our stock beds in order right away. It is now simple to work our bush-trees on true unmixed forms of Paradise and to discover what those types are. It is only one step further to adopt the idea of the standardization of free stocks by admitting the present demonstrable lack of uniformity, and by meeting the evil by careful root grading and selection and vegetative propagation of desirable types of free-growing stock. So far there is every indication that the influence of root stock is even more immediate than we thought when we initiated these experiments.

In conclusion, besides acknowledging the help of Mr. N. H. GRUBB in examining the free stocks very carefully, I am as usual indebted to Mr. J. AMOS for his assistance generally in these trials, and to Mr. A. W. WITT over matters of propagation.

A FIRST REPORT ON QUINCE STOCKS FOR PEARS.

FROM WYE COLLEGE FRUIT EXPERIMENT STATION, EAST MALLING.

By RONALD G. HATTON, M.A.

AN investigation upon stocks for Pears was initiated at this Station in 1914, where preliminary collections were got together from various English and foreign nurserymen. As in the case of the Apple Stocks, the subject can be most readily divided by dealing with the dwarfing and free-growing stocks separately. Hence it is intended in this present paper to deal only with the generally recognized dwarfing stocks for Pears, the various types of Quince in commercial use as stocks. It may, however, be well to say here that the other types of Pear Stock such as the Seedling Pears and Wildings and other forms of *Pyrus* are also under observation, and that it must not be too readily assumed that the Quince Stock is necessarily the only or even the best dwarfing stock obtainable for all purposes. For instance, considerable differences in vigour and quality of rooting are obvious both amongst collections of so-called "free" Pear Stocks and "wild" Pear Stocks, and it has not been found impossible to pick out types which promise to layer at least as readily as some forms of so-called Paradise Apple Stock.

The object of this paper, however, is merely to place on record a summary of the commercially used dwarfing stocks for Pears at the present time, different forms of Quince being used almost exclusively for this purpose, though trees worked upon the White Thorn (*Crataegus Oxyacantha*) and upon the Mountain Ash (*Pyrus Aucuparia*) are occasionally to be found.

Historical.

The literature and legend of the Quince appears to be as ancient as, if less prolific than, that of the Apple, and its use as a dwarfing stock, at least upon the Continent, seems to be as well known and as long practised as the use of the Paradise and Doucin. Certainly from the time of Le Gendre's "La Manière de Cultiver les Arbres Fruitières" (1652) working Pears upon Quince is regularly mentioned in French pomological literature, and many of the authors enlarge considerably upon its use. The first reference I have found to its use in our own country is by the writer of the "Compleat Planter and Cyderist" (1685) where he talks of taking Quince cuttings and suckers from old trees upon which to work Dwarf Pears. From this time onwards the use of Quince Stocks seems fairly general. As regards the supposed influence of the Quince upon the Pear and the relative merits of Free and Quince Stocks a considerable amount has

been written. Monsieur DE LA QUINTINYE (1693) asserts that "Pear Tree Graffs upon Quince Stocks love rather fat than dry soils . . . and Pear Tree Graffs upon Frank or good Kernel Stocks, prospering both well in sandy grounds." This seems the general impression amongst the old writers, and they might be somewhat surprised to-day to see the 'Conference,' 'Fertility,' and 'Dr. Jules Guyot' Pears worked on Quince prospering on many of our lighter loams in Kent.

Monsieur DE LA QUINTINYE, however, goes further; and he more or less divides pears into those "which are to be grafted on Free Stocks and which on Quince Stocks"; he gives definite reasons for his selections as in the case of 'Winter Bon Chrétien' which "grafted upon a Free Stock will produce greener fruit than that which is grafted upon a Quince Stock." Moreover, "this Boncretien tree should first be grafted upon a Quince Stock, chiefly because the Boncretien Dwarfs grafted on Free Stocks commonly bring fruit spotted, small, crumpled, etc., and consequently disagreeable to the sight."

The Quince and Free Stocks "shew themselves by the different colours with which they tinge their fruit."

It is a common thing, too, to find the effect upon the texture, flavour, and keeping quality of the fruit referred to.

THOMAS HITT (1757), who devotes no fewer than seven chapters to "Stocks proper for" various fruits, says with reference to Quince Stocks that "Suitable kinds may be propagated upon them, by examining the catalogue of pears and their qualities, and chusing such as are of the melting sort; for those of the breaking sort are apt to become stoney, especially in a dry summer; therefore these last sorts ought to be upon free stocks such as are raised from the Kernels of good melting pears, gathered from trees that are healthy." MILLER repeats this assertion about the grittiness of breaking Pears on Quince. SWITZER (1724), too, refers to the effect on texture and flavour, while DE LA QUINTINYE gives a concrete example of the latter where the defect of the "lemonish" taste in the 'St. Germain' Pear is augmented by Quince Stock.

There also seemed a general consensus of opinion that the winter or keeping Pears had better keeping qualities off trees on free stocks.

These writers were also aware that certain varieties of Pear "did not do" on Quince, whilst others did better on free stocks. NOISETTE in his "*Le Jardin Fruitier*" (1821), also refers to the fact that, around Vitry, Pear Stock was a failure and Quince Stock was invariably used. Whilst we should be ready to accept as true these latter facts, we hesitate to assert the value of many of the other observations made by these early pomologists. Now that we have isolated definite types of Quince and Pear Stocks, it will be possible to conduct more satisfactory trials, and to prove or disprove their maxims.

Identification of Varieties of Quince in use as Stocks at the Present Time.

At the outset of our investigations with Quince Stocks we proceeded along similar lines to those of our Apple Stock trials. We invited representative nursery firms to send us collections of the Quince Stocks they used. Again, they responded generously. We did not attempt to get together as large a collection as we made of Paradise, but some fourteen collections showed us :—

- (1) That there was more than one variety in common use.
- (2) That these varieties differed considerably :—

- (a) In ease of rooting from layers and cuttings.
- (b) In actual vigour of growth and health.
- (c) In early and mature root system.
- (d) In habit of growth and botanical characters.

- (3) That the correct nomenclature was as usual lost ; and that different varieties were sent out under the same name.

- (4) That several varieties had got mixed together.

- (5) That the variety of Quince most recommended as a stock by the older writers—the Portugal Quince—had practically gone out of use as a stock.

In the first place, therefore, we had to proceed to sort out and classify the various types. The Quince collections were treated as we had treated the Paradise collections, and were formed into stools, whilst so many stocks of each collection were grown on their own roots to show habit of growth and nature of fruit.

The work of classification was by no means as simple as it was with the Apple Stocks, where very obvious winter and summer characteristics only needed following carefully to ensure success.

Best Methods of Identification.

[We found the winter characteristics of the Quince layers practically no guide to us except as regards the stoutness and stiffness of wood growth and ease of rooting. There is very little difference in the colour of wood, the number and size of lenticels, or even the shape of the buds.

The earliness of bud bursting and the very early leaf colour gave the first clue. At this stage we could pick out at least three distinct shades of green, a characteristic which though it has remained constant each successive season, tends to become less obvious as the leaves grow mature.

Later, a careful examination of the mature leaves showed this to be one of the best methods of identification. Though superficially the leaves of the different varieties of Quince do not seem very distinct, the relative size, shape, surface, colour, and tip, as shown in Fig. 67, afford a really good line of demarcation. Careful measurement

of the leaves from each type has consistently shown that the same relationship persists between the breadth, length, and size on the types isolated. The following table of leaf measurements shows this relationship clearly:—

TABLE I.—*Average Leaf Measurements (on one-year Bedded Stocks).*

Type.	Breadth.	Length.	Leaf Stalk.
	cm.	cm.	cm.
A.	4·61	5·64	0·66
B.	3·97	5·00	0·62
C.	4·16	4·77	0·64
D.	3·84	5·09	0·59
E.	5·47	6·82	1·09

The other characteristic which proved a good guide to classification was the habit of growth of the one- or two-year Bedded Stocks, a habit which tends to become intensified as the plant grows older. At least four types were readily distinguished from their habit of growth, and even on the stools the practised eye soon recognizes the types from this characteristic alone. However, the Quinces in common circulation as stocks approximate to one another in botanical characters far more closely than the so-called Paradise Apples, yet they differ surprisingly in habit of growth and mature root habit—features which are very well illustrated in Figs. 62 to 66 inclusive.

The Chief Groups or Types of Quinces used for Stocks.

Table II. on p. 273 shows the most useful characters for identification purposes of the five main groups, which have either been used now or in the past as stocks.

The true nomenclature of these groups is not easy to identify, partly because the majority of nurserymen send out their stock simply as 'Quince,' yet the 'Angers' Quince of one is the 'Common' Quince of another and the dwarf type C of a third; and partly because the descriptions in pomologies of the commoner types of Quince are few and incomplete, and their origin is thus difficult to trace. For the time being, therefore, it will be better to refer to the types as Type A to E.

Type A (fig. 62).

Type A is undoubtedly the one in most common use to-day, though it is frequently intermixed with types B, C, and D. From our

TABLE II.—*Characters useful for Identification in Growing Season.*

Probable Identity.	Type A Angers.	Type B Common.	Type C ?	Type D De Fontenay.	Type E Portugal.
Bud bursting	early, end February	early, end February	medium, early March	late, mid-March	late, mid-March
Early leaves	yellow-green	yellow-green	bright yellow	green	silvery-green
<i>Growth—</i> Habit	vigorous bushy	moderate bushy, more erect than A	dwarfing very erect, dense, shrubby	moderate very spreading	very vigorous bushy, many branches in- clined
Shoots	long, slender	long, slender	short, wiry	very long, slender	long, stout
Internodes	medium, shorter than E	medium	short	long	long
<i>Leaves—</i> Size	medium	smaller than A	smallish	medium, smaller than A	large
Shape	ovate, longer than broad	ovate, rela- tively longer than A	broadly ovate to almost circular	ovate, much longer than broad	elliptical, longer than broad
Surface	wavy margin, concave, downy under surface	wavy margin, concave, very downy under surface	very crinkled, decidedly concave and downy both surfaces	often flattish to slightly concave, downy	wavy margin, concave, soft and downy surfaces
Colour	bright dark green	dull, lighter than A	dull, yellow green pinkish tips	dull, very dark green	bright dark green
Tip	broad and abruptly acuminate	acute	approximately a right angle, apex often obtuse	gradually narrowing to obtuse apex	broad abruptly acuminate apex
Position on stem	generally drooping or recurved	slightly drooping	generally hori- zontal, slightly drooping	held stiffly, often horizon- tal and upturned	irregular, often drooping
Leaf stalk	short	short	short	short	long
Stipules	longer than petiole lanceolate finely serrate	longer than petiole lanceolate serration almost obso- lete	often longer than petiole lanceolate entire	often longer than petiole lanceolate entire	very large lobed at base boldly serrate
<i>Roots—</i> 1 year layers	root very readily	fairly well rooted	not so well rooted as A	poorly rooted	very shy to root
4 year roots	many laterals much fibre good anchor- age	fairly well rooted	much fibre, not so strong as A	few strong coarse roots, little fibre	much fibre

experience of it as a Nursery Stock, I should say it appears to be both a grower's and a nurseryman's stock. It layers very readily, usually comes readily from cuttings too, is vigorous and healthy in the nursery row, and ultimately develops a very fine fibrous root system. In vigour it appears to stand midway between the Portugal and Apple- and Pear-shaped types, and the commoner types B, C, and E. Its leaves are smaller than the former types, larger than the latter. Its fruit is of medium size and quality, somewhat approaching that of the Apple-shaped Quince.

We have isolated another type of Quince Stock apparently identical in botanical characters with type A, though it seems slightly less vigorous. Until we have fruited this we cannot be certain of its identity, but possibly it is a seedling from A or a less vigorous strain. For the detailed botanical description of A see Table II.

Type B (fig. 63).

Type B is undoubtedly less vigorous than A, and it can be distinguished by the smaller acutely-tipped leaf. It is not quite so ready-rooting as A on the stool, but comes very readily from wood cuttings. Its fruit is small, hard, and downy, and quite distinct from A in shape. It would properly not make a bad stock, though in the nursery row it somewhat lacks vigour.

Type C (fig. 64).

Type C is readily distinguishable from all other types, by its very erect yet dwarf growth, and its small, circular, yellowish-crinkled leaves. It very soon lacks vigour, and the tips of the shoots often die, yet it roots fairly readily from layers, and remarkably well from wood cuttings. The small surface root development is very characteristic. I should be afraid that this type would be altogether too dwarfing for many varieties of Pear, but this supposition has still to be proved. Unfortunately I have on two or three occasions found this very dwarf type mixed in with the vigorous type A. As yet we have not fruited this type, or been able to procure any fruits of it. A type slightly more vigorous than this, but otherwise apparently identical, is also in our collection.

Type D (fig. 65).

Type D, with its exaggerated drooping habit and dark-green elongated leaf, again forms a very distinct type. It does not appear to be as vigorous as A, and is somewhat shy rooting on the stool, more so from cuttings. As it becomes more mature it seems to increase in vigour and develop quite a distinct root system, less fibrous and more coarse-rooted than the other types of Quince. It has borne a smallish, hard, pear-shaped, and very downy fruit, not unlike that of Type B. This type is also much intermixed with A and B, though



FIG. 62.—QUINCE STOCK (TYPE A), PROBABLY THE TRUE 'D'ANGERS' QUINCE.

Showing habit of growth and root development on two-year bedded stock.

[Face page 274.]



FIG. 63.—QUINCE STOCK (TYPE B), KNOWN AS 'COMMON' QUINCE.
Two-year bedded stock.

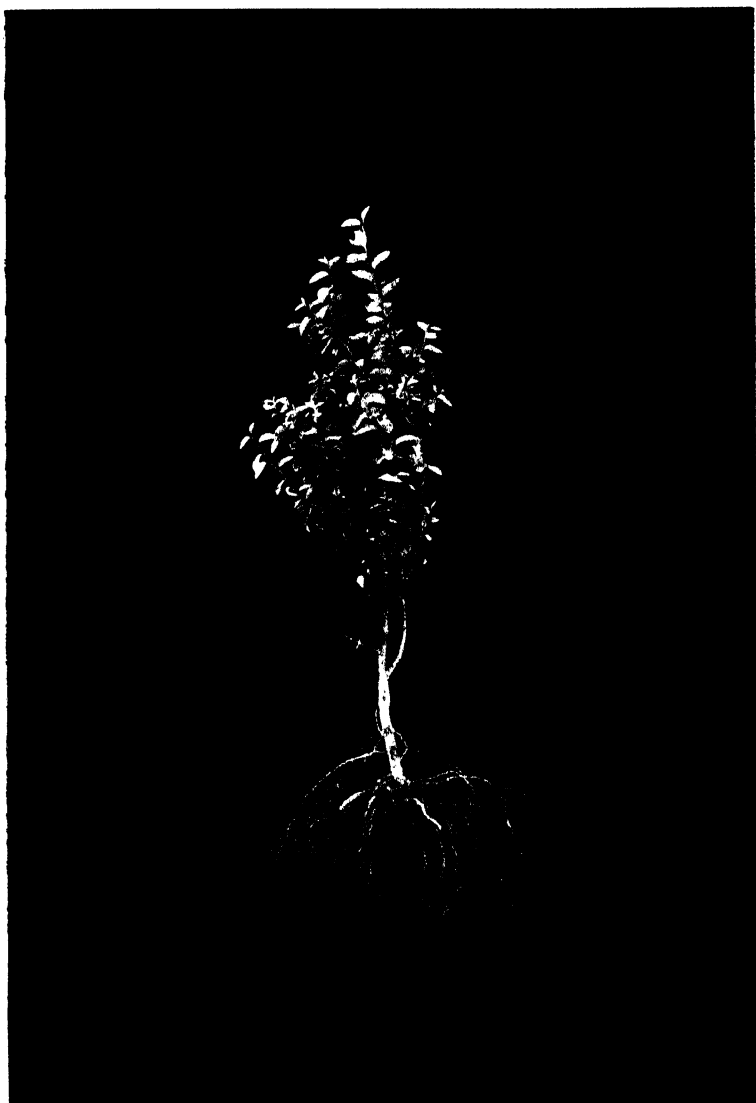


FIG. 64.—QUINCE STOCK (TYPE C), IDENTITY UNKNOWN.
Received under same name as Type A. Two-year bedded stock.

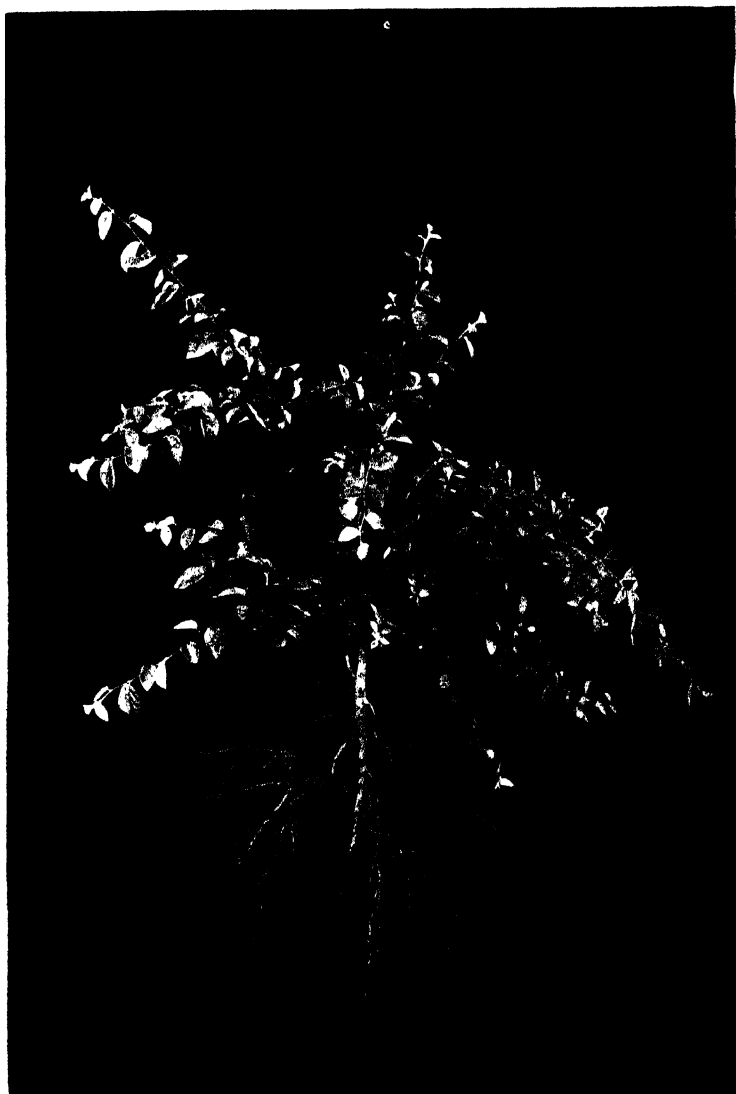


FIG. 65.—QUINCE STOCK (TYTE D), PROBABLY THE TRUE 'DE FONTENAY' QUINCE.

Two-year bedded stock. Note the long weak lateral roots and comparative absence of fibre



FIG. 66.—QUINCE STOCK (TYPE E), PORTUGAL QUINCE.
One year from stool. This type rarely roots in a single season and is therefore
left on stool for several years.

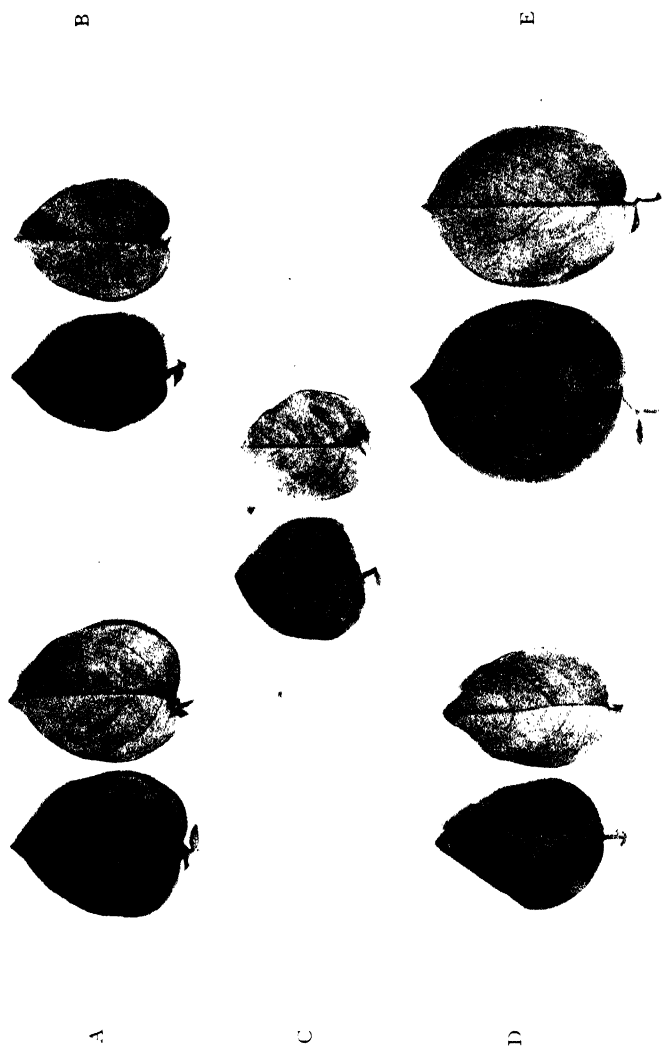


FIG. 67.—QUINCE STOCKS.
Relative size and general leaf characters, upper and under surface of Types A to E Quince Stocks.



E. A C
FIG. 68. QUINCE STOCKS.
Types of fruit of what are probably 'Portugal,' 'd'Angers,' and 'Common.' Quince.

it is quite easily distinguishable, but I should not like to recommend it until our ultimate trials, now in hand, yield their results.

We have also isolated another type of similar habit, yet until it has fruited I should not like to say it is identical with D, because the leaf shape is less uniformly elongated though dark in colour. Possibly it again is a seedling from D, for apparently, according to the older writers, it was no uncommon thing to raise the commoner Quince Stocks from seed.

Type E (fig. 66).

I have included Type E, which is chiefly grown to-day for its fruit as the "Portugal Quince," because it is the type which the older writers singled out for use as a Stock, though I have not heard of its being used for this purpose to-day. It is easily distinguishable from the other groups by its very large downy leaf and stouter vigorous growth, but it is very shy to root on the stool, layers sometimes taking several years to root, and then being too coarse to make good stocks. It comes still more shyly from cuttings. The older writers who recommended this particular stock were—with one exception—aware of the difficulty of raising it—yet they still thought it worth the attempt.

NOISETTE describes the Portugal as more vigorous than other types of Quince, and therefore the best for delicate Pears, "lesquelles, par son influence, prennent plus de vigueur." In his "Orchardist," SCOTT, who in his time was an authority on stocks, says: "The Portugal sort is a far better stock, being hardier, a free grower and keeps pace with the pear worked upon it, whilst the graft overgrows the other varieties when used as stocks; these are, however, much more used than the Portugal as they are freer to strike root. Hence the Nurseryman can more easily get up a supply for grafting his Pears upon."

SCOTT re-inforces his opinion by quoting MERLET's recommendation of the Portugal in 1667. DUHAMEL again laments that the Portugal is not in common enough use as a stock owing to propagation difficulties; yet in the "Herefordshire Pomona" it is described as "very easily propagated by cuttings, suckers or layers, and the young trees are used as stocks to bud and graft pears on." Certainly the Portugal on our soil is as reluctant to root adventitiously as it was in the seventeenth and eighteenth centuries, and it is still so in many other places. Unless the Portugal is pre-eminently worth using as a stock, it is certainly not worth raising on a larger scale for this purpose. I hope our trials may soon give some definite evidence on this point. The fruit of the Portugal is undoubtedly of better quality and larger in size than that of any of the Groups so far mentioned, and though it is reputed to be very shy bearing, during this season (1919) it bore quite profusely for small bushes. The fruit is somewhat pear-shaped, and loses its down, becoming smooth.

The Apple- and Pear-shaped Quinces.

I cannot find that either of these types has been used at all commonly as stocks, and I am therefore not desirous to overload my report by giving a detailed botanical description of them at present. They are both more vigorous than any of the types from A to D, and they approximate somewhat closely in leaf character and vigour to E, the Portugal, though they are not quite so vigorous. Whilst the Apple-shaped is almost as shy rooting as the Portugal, the Pear-shaped roots fairly readily both from layers and cuttings, and appears worthy of a trial as a substitute for E.

Historically the Apple- and Pear-shaped Quinces appear as old as the Portugal, but they are rarely mentioned as useful for stocks.

More Recent Introductions.

With regard to the more recent introductions of the Serbian Quinces and larger-fruited kinds such as Bereczeki and Rea's Mammoth, nothing need be said here at present. They probably have never been used as stocks so far, though they are certainly fine fruited varieties.

Probable Identification of Types A to E.

I think there is little doubt that our type A is the true d'Angers Quince, both because it has long been known and widely circulated and because the description of its fruit seems to confirm the consensus of opinion.

Type B which was sent to us as 'Common' Quince, may possibly be the prevalent Common English Quince so often reviled for its small, hard, gritty fruit, but the fruit of type D appears to rival this in poor quality. BATTY LANGLEY talks of the English Quince as "the very worst of all." Type C, which came to us as 'Angers,' is almost certainly not the true 'Angers.' There is an interesting description by ELLIOT, in his "Western Fruit Growers' Guide" (New York, 1859), "of the 'New Upright' (or Paris de Fontenay)—a variety first introduced to notice (in America) by Messrs. Ellwanger and Barry, of Rochester, N.Y. It grows upright, strikes readily from cuttings, but after the first year's growth seems to lose vigour and afterwards grows very tardily." Unfortunately no botanical characters are given, but the description is extraordinarily near to our own observations of the Upright Dwarf.

The Paris or de Fontenay Quince has been known and used as a stock for some time. SCOTT calls it merely a "variety of the Angers"; and many of the Continental firms to-day still use a "de Fontenay" Quince as a stock. Curiously enough, the "de Fontenay" Stocks we received were very mixed and comprised Type D, our very spreading type, together with a more or less erect type approximating to A, but by no means exceptionally dwarf-

ing. Until I recently saw ELLIOT'S description of 'de Fontenay' I inclined to think the drooping variety was the true one, as I received this largely from France.

Of type E, the Portugal Quince, I think there is little doubt, since its fruit and general characters have been so often described; but it also seems probable that some writers have seen its likeness to the Pear- and Apple-shaped Quinces and confused the three. SWITZER and LANGLEY, indeed, talk about the Portugal Apple-shaped and the Portugal Pear-shaped Quinces, but MILLER gives the three varieties separately as :—

Cydonia oblonga.—Pear-shaped. Leaves oblong ovate.

Cydonia maliformis.—Apple-shaped. Leaves ovate.

Cydonia lusitanica.—Portugal. Leaves oblong ovate.

Methods of Propagation.

The methods of propagation used for raising Quince Stocks has been similar to that which we have used for 'Paradise' Apple Stocks. We have used both layers and cuttings with the varied success stated above. We always root on the one-year wood, and strip the stool annually. The layering method, as opposed to the ordinary stool method, seems more effective with the Portugal Quince.

TABLE III.—*Average Measurement of Bedded Stocks
(once transplanted).*

Type.	Height.	Spread.
A	3	2' 17"
B	2' 4"	1' 10"
C	1' 11"	11"
D	1' 10"	2' 9"
E	3' 5"	2' 11"

Now that the period of classification is practically complete, we have worked up a considerable number of stocks of each type, some of which were worked this last season. We propose to undertake a series of experiments with a fairly wide range of Pears, because the whole question of Pear-growing commercially in this country and of double working varieties opens up a wide field for advance through careful research.

As usual, I am indebted to Mr. J. AMOS, my foreman recorder, for invaluable help in the classification work, and to Mr. A. W. WITT, my propagator, for conducting experiments in raising the varieties. From time to time I have also had the ready advice and help of Mr. H. WORMWALD, M.Sc., of the Wye College Research Department. Mr. R. A. MALBY has executed the photographic work for me.

THE SYSTEMATIC AFFORESTATION OF GREAT BRITAIN.

By Mr. A. D. WEBSTER, F.R.H.S.

[Read July 15, 1919; Mr. W. HALES, A.L.S., in the Chair.]

In connexion with the proposed Government scheme of afforesting a million and three quarters acres of ground, while strict economy should be exercised and all useless expenditure carefully avoided, nothing should be spared that is really required for the success of the enterprise. A well thought-out and systematic procedure must therefore be instituted, all haphazard work being avoided. Forest produce requires a long time to mature, and it is therefore all the more necessary that a reliable foundation should be laid. In tree-planting it is the falsest economy, under the pretence of cheapness, to buy defective plants, to employ defective methods of planting, or to use species unsuited to the soil and situation. Before actual planting operations are commenced, several preliminaries must be attended to, and they may be dealt with in the following order:—

1. Distribution of the wooded areas.
2. Laying out the boundaries.
3. Fencing.
4. Clearing the surface of rough-growing vegetation.
5. Draining where necessary.
6. Marking off the roadways.
7. Pitting or otherwise preparing the ground for the reception of the young trees.
8. Planting.

There is another important preliminary which in existing circumstances should receive attention, and that is raising the plants for the afforesting scheme. Little or no foreign seed, on which we have mainly depended in the past, has been sent to this country during the war, and there is a dearth of young forest trees. For this and other reasons, the formation of suitable nurseries and the raising of a considerable portion of the young stock required should have priority over every other operation, as three years, at least, will be required to produce plants of the necessary age and size in sufficient quantity.

Distribution of the wooded areas.—A fair and equal distribution of the 1,770,000 acres that the Forestry Sub-Committee proposes to afforest will require very careful consideration, and must be largely determined by the amount of waste land that is found in each part of the country. Other matters of minor importance must also receive attention in dealing with this question, such as quality of soil, general

accessibility of the land for timber removal and nearness to consuming centres.

Taking the agricultural returns as a basis for the area of waste lands in the British Isles, we find that a fair division would be as follows :—

Scotland	.	.	.	800,000 acres.
England	.	.	.	400,000 „
Wales	.	.	.	300,000 „
Ireland	.	.	.	270,000 „
Total	.	.	.	1,770,000 acres.

Both the Scotch and Welsh collieries consume a vast amount of timber, less so those in England and Ireland, so that in allotting the area of land for afforestation this important point has been kept in view. Accessibility of the woodland and convenience for removal of the timber by rail, road, or water have also been considered in conjunction with the existing area of waste land.

The next, and a most important point, is the rate at which tree-planting should proceed. The Forestry Sub-Committee recommended that the area should be planted in a period of eighty years, 1,180,000 acres being dealt with during the next forty years. Now, in the opinion of those competent to judge, not only is the area to be afforested too small, but the period over which the planting is extended too long to be of any practical value in the way of meeting our wants in the near future in the matter of timber supplies. By this arrangement only 250,000 acres would be planted during the first ten years, and as the whole planting scheme is spread over eighty years, fully one-half of the proceeds of the enterprise would not be available for use for at least a century to come.

In order, therefore, to meet our early requirements, the largest possible area should be afforested at once or during the next ten years and the whole planting scheme reduced from eighty to twenty-five years. By spreading the work over a period of twenty-five years, we find that in England 20,000 acres would be planted each year, Scotland 28,000, Wales 12,000, and Ireland fully 10,000 acres. The Government should find no difficulty in carrying out these propositions, a statement that is based on the fact that 20,000 acres of heath and mountain land were planted by the owner of the Seafeld estate in Scotland, while other private individuals, as well as several corporations and water works, have been most successful in afforesting large areas of unprofitable mountain land that were far removed from both road and rail.

Temporary buildings for the accommodation of the numerous workmen to be employed must be provided; but with large numbers of soldiers' huts and canteens on hand, the Government will find no difficulty in dealing with the housing problem.

Laying out the boundaries.—In laying out plantation boundaries

several important considerations, on which the future economic value of the plantation will greatly depend, need attention. Altitude, exposure, nature of the soil, and facilities for getting out and disposing of the produce are all potent factors, and must not be lost sight of. In conjunction with economic tree cultivation, some attention should also be given to the shelter afforded to adjacent lands and farm stock, as such neither interferes with the value of the plantation, nor is attended with extra expense in cultivation.

Many considerations will tend to determine the position of boundaries, such as bounds of property, proximity to roads and paths, and the existence of future probabilities of modes of transport, all being more or less significant factors.

The shape of the plantation will greatly depend on the area of the enclosure and conformation of the ground, and in exposed situations we have to consider how best to prevent long-continued and hard-hitting winds from injuriously affecting the health of the trees. The form of outline must, therefore, be laid out with due regard to the prevailing wind, and should always present a convex side towards it, as it is obvious that on striking such a curve the force of the wind would be divided and expend itself in two opposite directions, thereby losing much of its destructive power. When it is intended that the plantation should serve the double purpose of sheltering itself as well as the adjoining lands, the outline should be nearly that of an acute angle with the apex presented to the wind.

Fencing.—In the preparation of ground for planting, efficient fencing is an indispensable operation, and should be attended to immediately after the clearing of the ground. The first object to be aimed at in a fence is durability, and the least possible ultimate expense in conjunction with utility. To recommend any particular class of fencing would for various reasons be invidious, and its nature must be largely determined by local circumstances.

In connexion with fencing it should be remembered that the larger the area enclosed, the smaller the cost for each acre—provided, of course, that judgment is exercised in laying out the boundaries; but in any case it is one of the most expensive items, and as such should be carried out with as little cost as is consistent with durability and the object in view. Circumstances will help to decide which class of fencing is most desirable for enclosing the plantation. Where stones are plentiful a stout wall built “dry” and with the copestone laid in mortar may be found both cheap and efficient; while a deep ditch and stout bank, planted atop with thorn, beech, or hornbeam, has been found an excellent protection in high-lying and exposed districts. Wood and wire fences are sometimes adopted, particularly when timber is available on the estate; but all these are now almost entirely superseded by iron and wire fences, which are readily erected in any situation at a comparatively moderate cost.

Clearing the ground.—In all cases clearing may not be necessary, but where heath, broom, furze, bramble, and strong-growing grasses are

present, they will be found detrimental to the growth of the young trees if left untouched. Burning is the simplest, least expensive, and most expeditious method of checking the growth of heath, bramble, and wiry grasses, while in the case of shrubby growth, such as gorse and broom, uprooting the plants and reducing them to ashes on the ground is often a necessity, particularly where the growth is old. On high-lying and exposed ground the surface growth is usually dwarf, and can readily be dealt with by burning during dry, windy weather. Burning will not eradicate heath, but will so check its growth that, by the time it recovers, the young trees will be able to hold their own and be beyond all danger of injury. Advantage has been taken of existing shrub growth, in the way of shelter to the newly planted trees, on both the Snowdon and the Lothian hills, in the formation of young plantations. Usually, however, all surface vegetation of rough growth is disposed of.

Drainage.—The amount of drainage necessary will vary greatly, according to the nature of the soil and subsoil and general lie of the ground. Some portions of the land may require little or no drainage, while in low-lying and boggy situations the removal of stagnant water is probably the most important operation in connexion with the formation of a plantation. It is well known that stagnant water has a most injurious effect when present in the soil, and causes the young trees to have a stunted, sickly appearance, to make little progress, and often die out altogether. As before said, there may, however, be many acres where not a single drain will be required, and the evil of over-drainage must also be carefully guarded against. On the other hand, when the soil is in a sour, unhealthy condition because of excessive moisture, the vegetation invariably indicates it. Patches of heather and other native plants on a wet moorland, particularly where the underlying stratum is moor pan, are usually stunted in growth, sickly in appearance, and covered with lichens. In proceeding with drainage operations, the general lie or inclination of the ground must first be taken into account, in order that both the main and minor drains may have full advantage of the greatest fall possible. Straightening and cleaning existing water-courses will also be found of the greatest value in removing surplus moisture from the soil.

The main drains should be carried along the lowest part of the ground, or in a natural hollow, to which point the water from the minor drains may be readily conveyed. For main drains the usual size is 3 feet wide at top, 3 feet deep, and from 1 to 2 feet wide at bottom, the minor drains being less in proportion, or 2 feet deep, 2½ feet wide at surface, and about the width of the draining spade at bottom. According to the amount of moisture in the ground, so will the distances at which the drains should be cut vary; but in ordinary cases these should not exceed 30 feet, or be less than 10 feet apart. The minor drains must never run at right angles to the main so as to cause obstructions, and in all cases the sides of the ditches

must be allowed an easy slope, so that falling in may be avoided, and also to allow of cleaning or scouring out when necessary.

Where the ground is steep the drains should be cut obliquely across, never directly down the declivity.

Roadmaking.—Where the plantations are of large size a most necessary work in connexion with the formation, and one which will add materially to their value, is the construction of suitable roads for the removal of timber and general working of the woodland. On level ground parallel roads at suitable distances apart and converging to convenient and readily accessible points are desirable, but on hilly and broken ground the general contour must be taken into account, and the readiest way for the removal of timber carefully considered. But in any case the direction of roads should be determined early, and before the general formation of the ground is hidden by the growth of the young trees, although it may not be essential to lay these down permanently at such a date, the work being deferred until the inclemency of the weather puts a stop to planting operations. Neither is it necessary that such roads should be of a costly nature, as in many instances capital tracks for the removal of timber have been formed by simply opening a ditch on one or probably both sides of the roadway and levelling the surface inequalities. The roads should be 18 feet wide and their numbers regulated by the area of the woodland, while minor roads for the removal of thinnings and general management of the trees can be cut out when this branch of management is to be taken in hand.

If the principal roadway is intended for carriage traffic it may be necessary to expend more time and money on its construction; for timber removal the foregoing will, however, fall in with general requirements.

Planting.—Three methods of tree-planting are usually employed—pitting, notching, and inserting by means of the planting iron. The advantages, however, of pitting over any other system of planting cannot be questioned, and this is particularly the case with land that has hitherto been uncultivated. When compared with any other system of planting young trees, pitting is, no doubt, more expensive, but the results obtained are most satisfactory, and warrant the extra outlay.

When at all convenient, the pits should be opened for some time before planting is engaged in, as the exposure of the soil to the weather is highly beneficial. The pits should be made circular or square, and about 18 inches in diameter, and 12 inches deep, the soil at the bottom of each pit being loosened by the spade or pick. This refers to land that has not before been under cultivation; but in the case of recently cropped land, the pits may be proportionately smaller, according to the looseness of the soil. Pitting is often performed by contract at a fixed price, the amount varying, according to the hardness of the soil, from 1s. 6d. to 2s. 6d. a hundred.

The surface turf, where such is present, should be removed and

placed on one side of the pit, and the loose soil on the other side, which will greatly facilitate the speedy insertion of the young trees. Before planting, the turf is usually placed in the bottom of the pit, and, after being chopped into small pieces by a spade, is covered with a few inches of fine soil.

Moor-pan soil, which is usually found on heathy gravelly ground, is detrimental to the healthy growth of trees and should be broken up. It occurs on gravelly soils which contain a large quantity of oxide of iron, and forms a hard stratum, through which the roots of young trees are unable to penetrate. The best implement for breaking up the pan is the foot-pick, which is driven in to such a depth that the hard crust is broken up.

Slit or notch planting.—This system of inserting young trees is most frequently practised in hilly ground, and is done by simply cutting the soil or surface with two strokes of the spade or planting-iron, and to the depth of about 5 inches; thus: L T.

With the first stroke the spade is inserted in the ground in an almost perpendicular direction, and to the depth of about six inches. It is then withdrawn and inserted at right angles to the first opening, and to a similar depth, and by pressing down the handle of the tool the turf is opened up, and the plant inserted from the blade of the spade towards the other end of the slit. The spade is next carefully withdrawn, and the opening closed by firm tramping of the surface. The operation should be performed by two persons, one to open the notch, and the other to insert the plant and assist in making it firm.

The planting-iron, which is about 17 inches long and weighing about 3 lb., is chiefly employed in the planting of mountain land, and is most economical on account of the rapidity with which it can be used. Holding the iron slackly, the planter strikes it into the ground with a force sufficient to drive the sharp, heart-shaped blade in about 3 or 4 inches. By pressing it down and towards the planter with a slight twist to the right, the left corner of the turf is opened up. Into this opening the roots of the plant are carefully inserted. The iron is then withdrawn and the loosened turf made firm by tramping.

By this method plants can be inserted in the crevices of rocky ground where it would be impossible to place them in any other way. The planter is supplied with a bag which is slung over the shoulder and hangs down at the back, in which from 500 to 600 plants are carried. On the Lothian hills we have seen fully an acre of ground planted in a day with this tool.

During favourable weather tree-planting may be most successfully carried out from about the beginning of October to the end of February, but, generally speaking, autumn planting is to be recommended. There are, however, several exceptions, such as on exposed or maritime situations, on water-logged soil, and peat-bog, when spring planting is preferable; but in all other cases tree-planting in the British Isles should be commenced soon after the fall of the

leaf, which usually takes place in the second or third week of October, according to season.

Local Nurseries.—The formation of local or temporary nurseries on or near the site of the intended plantations is strongly recommended, and has been attended with the most satisfactory results when dealing with high-lying and exposed mountain lands both in Scotland and Wales. It is well known that too sudden a change from rich, well-sheltered nursery borders to bare, exposed hillsides often proves fatal to young plants, and when we bear in mind that public nurseries are rarely situated at a great elevation, the necessity of specially rearing stock that is to be planted at 1,000 feet and upwards above sea level will readily be understood. There are certain difficulties to contend with in planting high-lying grounds that are often of poor quality, and in dealing with such the advantage of using hardy plants that have been reared at a fair altitude will be apparent to all. The formation of local nurseries on the site of intended plantations is, therefore, to be strongly recommended and would do away with many of the evils just mentioned.

Seed-sowing and the general treatment of the young plants should be similar to that carried out in our home or public nurseries, but as the young trees are of comparatively slower growth at the higher altitude, they should remain for a year longer in the nursery before being planted out permanently.

Trees to plant.—In any large afforesting scheme no doubt the larch, spruce, Scotch, Corsican and Weymouth pines will be commonly planted. They are all adapted for high-lying exposed ground, and produce a large amount of comparatively valuable timber. The choice of trees is a most important point, but one that, unfortunately, is often lost sight of in the formation of plantations. Travel where one will, plantations that are comparatively valueless, from a commercial point of view, are to be found, and these, too, occupying positions where other and much more valuable timber-producing trees could be cultivated. Too often also, whether from wishing to obtain trees at the smallest cost or from a mistaken idea that if one kind does not succeed another will, mixed trees of the worthless type for timber-producing purposes are included in young plantations. Nowadays it is quite well known which particular species of tree is suitable for planting on soil of a special kind, so that there is no justification for the haphazard method of including mixed lots on the plea that one or other will suit the soil. Also, it is the falsest economy to buy poor, rubbishy and defective plants under the pretext of cheapness. The very best—well-rooted, stiff, sturdy, clean young trees—should alone be chosen, even at a higher cost, instead of such as are at all defective and unlikely to succeed.

Defective methods of planting must, too, be guarded against; indeed, in forming a plantation the utmost care is necessary to ensure that every operation is carried out on an approved principle, and by those who are practically acquainted with the work. Most trees

will succeed in any soil of fairly good quality, but it is a well-known fact that some species will only succeed satisfactorily when planted under certain conditions, whether as to the nature of the soil or the amount of dampness that is present in the ground. Thus, as examples, we may take the Cluster and Aleppo pines, which succeed best when planted in sand on the sea-coast, the beech and yew on chalk, the deciduous cypress and willow on damp ground, the birch and Scotch pine on poor, thin soils, the oak on loamy clay, the sweet chestnut on deep, gravelly soils, and the white beam and maple on dry soils. Again, the larch is peculiarly free from disease when planted on peat bog, while on gravelly soils and chalk it gets diseased and hollow-stemmed.

From an economic point of view the best trees to plant are such as will produce the largest volume of the most valuable timber in the shortest space of time.

In connexion with afforestation, the following remarks on planting waste land as carried out under my personal supervision both in Wales and Scotland may be of interest. The plantation in Scotland was one of several that was formed near the base of the Pentland Hills, in Midlothian, on exposed moorland ground on Sir George Clerk's property, the other being on a spur of the Snowdon range on Lord Penrhyn's estate in Carnarvonshire. These plantations are rendered of particular interest from the fact that in one case notch planting was entirely carried out, while in the other the whole of the ground was pitted previous to inserting the young trees. Further, both were formed on poor upland and fully exposed ground, the main object being profit and shelter; while all expenses were carefully noted in the matter of clearing the land, fencing, draining, and planting.

Scotch plantation.—This was formed on a bare, exposed moor, the surface vegetation of which was largely composed of heath and mountain grass. The area being comparatively flat was readily dealt with in the matter of erecting the boundary fences, while drainage was only found necessary in a few of the hollows. Owing to the elevation and the exposure of the moorland, the surface vegetation was dwarf and but little interfered with. Where the heath was of rampant growth burning was resorted to, and in a few patches of damp ground open ditches relieved the soil of superfluous moisture. Fencing was of the usual type—iron and wood—the larch posts being obtained from the home woods, and the whole erected by estate workmen. Seven wires were used in conjunction with the posts, as the dwarf mountain sheep are difficult to keep in bounds. Planting was carried out by the estate workmen and a gang of casual labourers, the whole of the trees being inserted by the notch system of planting. For small plants this is by far the cheapest and most expeditious method of planting, and for this each man was provided with a half-worn garden spade. The planters worked in extended lines, each man taking his distance from his neighbour, right or left, according

to the leading man. For every two men a boy was provided, whose duty it was to carry the plants and insert them in the notch, the planter seeing that the roots are not doubled up, and that they are inserted to the proper depth and properly tramped in. The plants used were one year seedling, one year transplanted, and raised in an exposed nursery on the estate. The cost of forming this plantation was £3 5s. an acre, the plants used being at the rate of 2,000 Scotch and 1,000 larch an acre. Spruce was planted in the damper hollows.

Welsh plantations.—During the strike of workmen at the Penrhyn Slate Quarries the idea occurred to the late Lord Penrhyn to afford suitable employment to a number of the men by planting up a considerable area of ground on an exposed spur of the Snowdon range of hills. One wood in particular that was formed under the supervision of the writer by unemployed labour is now an object-lesson, not only in what can be done in the planting of comparatively waste mountain land, but also by uninitiated workmen when placed under proper supervision.

The plantation referred to extended for a considerable distance along the hillside, ranged in altitudes from 500 feet to upwards of 600 feet, and was fully exposed to the long and hard-hitting winds blowing in from the Irish Sea. Previous to planting, this ground, with hundreds of acres of the adjoining hillsides, was rented by the farmers as sheep pasture at a few shillings an acre. Gorse, broom, heath, and the dwarf willow constituted the shrubby vegetation, other plants including the parsley-, hay-, and scented-ferns in abundance; while *Vaccinium*, cotton grass, sundew, and *Sphagnum* tenanted the damp ground. The higher side of the area planted was protected by a stone wall, the lower boundary being an iron and wire fence. The preliminary work consisted of clearing the ground of all rough-growing vegetation that might impede planting operations, draining where necessary, and levelling over a few half-demolished ditches and turf fences that had existed in years gone by.

Everything being in readiness for straight-ahead work, about a hundred quarrymen were engaged as a start, few of whom lived nearer than two miles from where the plantation was being formed. They brought their food with them. A rough, temporary shelter served for rest and recreation, and as a cook-house. Pay was at a similar rate to that on the estate, and each man was provided with the necessary tools for pitting and planting.

In charge of the squad were a general foreman and several gangers, whose duty it was to mark off where the holes were to be dug out, and generally supervise operations. The men worked in line and in batches of twenty, digging the pits to the stipulated size of 15 inches square and 12 inches deep, the bottom and sides of each pit being loosened by means of a fork or pick where the soil was not considered sufficiently friable for the reception of young trees. The top turf was removed in two halves about 2 inches thick, and after being

thoroughly chopped up by the spade, was placed in the bottom of the pit and covered with a small quantity of soil. By so doing the pits were left ready for the reception of the young trees, and by the time that the whole of the ground was so treated the first-opened holes and soil had received the benefit of their exposure to the weather. Tree-planting was carried out by the same staff of workmen, with the aid of boys for holding the plants and keeping them in an upright position while the roots were being covered with soil. Here a good deal of supervision was necessary, not only to ensure that the plants were well headed to the prevailing wind, but that the strongest roots were spread out in the same direction and covered to a proper depth with firmly tramped soil.

SUMMARY.

Briefly, the systematic afforestation of Great Britain may be summarized as follows:—

1. *Government Scheme*.—To plant in all 1,770,000 acres over a period of eighty years; 1,180,000 acres being dealt with during the first forty years, or at the rate of 295,000 acres per annum. The total cost is put down as £15,000,000, or at the rate of £8 16s. 5d. an acre.

My proposed scheme.—As a commencement it is proposed to plant 1,000,000 acres over a period of twenty-five years, at the rate of 40,000 acres a year. The cost of so doing will approximate £290,000 per annum, or £7,500,000 for the whole scheme.

The subdivision of this area and expense would be for :

	Acres.	Cost.
England . . .	200,000	£1,500,000
Scotland . . .	400,000	£3,000,000
Wales . . .	250,000	£1,875,000
Ireland . . .	150,000	£1,125,000

2. *Choice of land for afforesting*.—This to be as near the consuming centre as possible, taking into account quality of soil, accessibility, and existing conveniences for the removal of timber.

3. *Laying off and fencing the boundaries*.—The form of outline should be laid out with due regard to the prevailing wind and with a convex side presented to it, the boundaries being made as short as possible, all unnecessary curves and corners being avoided on the score of economy in fencing.

4. *Preparation of the surface*.—Rough-growing vegetation, but only such as would impede planting operations, should be removed. Drainage, as little as is competent with the healthy growth of the trees, should be permitted.

5. *Planting and trees to be used*.—On account of cheapness slit or notch planting wherever possible should be engaged in. The best trees to plant are such as will produce the greatest quantity of the most valuable timber in the shortest space of time.

6. *Tree nurseries*.—These are strongly recommended and should be formed at elevations nearly approaching those of the plantations to be formed.

7. In connexion with the formation of plantations the success of the undertaking will largely depend on :

Strict economy in every operation.

Efficient supervision.

A bold, well-planned, and continuous policy.

MENDELIAN CHARACTERS IN BEARDED IRISES.

By A. J. BLISS, F.R.H.S.

SOME twelve years ago Mr. W. R. DYKES called my attention to a character in Bearded Irises that I had hitherto taken no notice of—the colouring of the base of the leaves in some varieties. Another character, the brown tipping of the hairs of the beard, had always interested me, and having at the time several large pods of fertile seed of the Iris 'Maori King' crossed by other varieties, I thought it would be worth while to keep records of these characters for the whole of these series of seedlings, in the hope that they might give, at least, an indication whether they were Mendelian characters, and whether, in each case, one or several factors were involved. As I keep full records of all my seedlings, it would also be possible to see if there was any connexion between these two characters and the types and colours of the flowers. I may say at once that there seems to be no evidence of any such connexion, nor of any connexion between the characters themselves, as the analysis of distribution in pairs given for G. 190 shows, and the analysis of the other crosses show similar indeterminate results. The numbers are, however, too few to justify any very definite conclusion. The figures for the single characters, however, do tend to show that both the colouring of the leaves and the tipping of the beards are Mendelian characters—possibly single unit characters—but from observation of many other seedlings of other crosses I am inclined to think that, at any rate in the colouring of the leaves, two or more cumulative colour factors (C.C.C.) are concerned, as well as a red factor (R.) and a blue factor (B.). For the range of intensity of the colouring—from very faint and confined to a few inches of the leaf at the base to a deep indigo suffusing the leaves nearly to their tips—seems too great to be accounted for by the difference of a single or double dose in heterozygote or homozygote with only one unit character. The "red" and "blue" differences are also quite distinct.

The tipping of the beard also ranges from the presence of a few brown-tipped hairs to a staining of the whole beard nearly down to the roots of the hairs, and I should therefore expect cumulative factors for this character also.

Though based on the observation of large numbers of seedlings, these are of course only impressions, and even the experiment of these crosses and their results recorded here can make no claim to scientific exactitude. For the crosses were not made originally for this purpose, and the flowers were not protected. The degree of reliance, however, in the results may be indicated by the fact that

I always removed the stamens of all Iris flowers out early each morning, and no flower not hand-fertilized set a pod that year. The resulting seedlings in each case were quite uniform to type, and about what might be expected from the cross. Here where there are more bees I have many bee-crossed pods of seed every year, and I have sowed a few. The resulting seedlings are never uniform in type, and are sometimes very mixed.

The crosses were made in 1906 and the last seedling flowered in 1917, but the majority flowered before 1912. As regards the characters, no record was made of any difference of intensity of the colouring of the leaves. The tipping of the beard does not seem to be a sharply marked character (with the varieties used), and I found a difficulty in classing the cases where the tipping was weak or slight, but I give the figures as I recorded them, noting these doubtful cases. The classing of the colours of the flowers proved unexpectedly easy, the criterion of the division between the two classes being presence or absence of yellow. Thus they are practically divided into "blue" or blue-purple toned *Neglectas* and *Amœnas* on the one side, and more or less reddish-toned yellow-suffused *Squalens* and *Variegata* on the other. (This division was chosen the first year of flowering when less than half had flowered.) In the cross G. 189—a *Variegata* by an *Amœna*—there were no *Squalens*, the dividing line was very sharp, and it almost looks as if *Amœna* and *Variegata* were allelomorphic colour varieties. In the same way *Neglectas* appear to be *Squalens* in which the yellow factor is suppressed or absent.

CHARACTERS OF THE PARENT VARIETIES.

Parent.	Type and Colour.	Beard.	Leaves.
Maori King .	(V) <i>Variegata</i> S. Yellow F. Deep red brown	(T) Tipped (not strong)	(C) Coloured (not strong)
Cordelia .	(N) <i>Neglecta</i> S. Heliotrope F. Red purple	(T) Tipped (strongly)	(G) Green (not coloured)
Thorbeck .	(N) (<i>Amœna</i>) <i>Neglecta</i> S. White F. Indigo purple	(Y) Yellow (not tipped)	(C) Coloured
C. 8. a. = Cordelia × Thorbeck	(N) (<i>Amœna</i>) <i>Neglecta</i> S. White F. Deep purple	(Y)* Yellow (not tipped)	(G)* Green (not coloured)
E. 233 = Mme. Chereau × Mrs. H. Darwin	(N) (<i>Pallida</i>) <i>Neglecta</i> Self Red purple (<i>Rubella</i> type)	(Y)* Yellow (not tipped)	(C) Coloured (strong)

* C. 8. a. and E. 233 were early seedlings, long since "scrapped," and at that time I did not use any negative symbols, simply recording a character if present and making no record if absent; thus the beard and leaves of C. 8. a. and the beard of E. 233 are not definitely recorded as being not tipped and not coloured, but I think there is no doubt that they were not.

G. 188. 'Maori King' × 'Cordelia,' 79 seeds germinated, 66 flowered, 13 died unflowered.

Type and Colour of Flowers.	Beard.	Leaves.
(N) Neglecta type purple, white ground } 32	(T) Tipped 46	(C) Coloured 37
(V) Variegata and Squalens } 34 yellow ground	(Y) (not tipped) 20*	(G) Green 33 (not coloured)

G. 189. 'Maori King' × 'Thorbeck,' 49 seeds germinated, 43 flowered, 6 died unflowered.

Type and Colour of Flowers.	Beard.	Leaves.
(N) 19 (V) 24	(T) 14 (Y) 29†	(C) 38 (G) 7

G. 190. 'Maori King' × C. 8. a. (= 'Cordelia' × 'Thorbeck'), 74 seeds germinated, 66 flowered, 8 died unflowered.

Type and Colour of Flowers.	Beard.	Leaves.
(N) 32 (V) 34	(T) 36 (Y) 30†	(C) 39 (G) 30

Combinations or distributions of the characters in pairs of the seedlings of G. 190 cross.

Colour of Flowers and Leaf Colouring.					
(N)	(C)	(N)	(G)	(V)	(C)
21		11		17	17

Colour of Flowers and Beard.					
(N)	(T)	(N)	(Y)	(V)	(T)
18		14		18	16

Colouring of Leaves and Beard.					
(C)	(T)	(C)	(Y)	(G)	(T)
19		19		17	11

* Fourteen of these twenty were slightly tipped.§

† Five or six were slightly tipped.§

‡ Six to nine of these thirty were very slightly tipped.§

§ Of the beards noted as being slightly tipped many had literally only half-a-dozen hairs tipped and only to be detected with a lens.

G. 187. 'Maori King' $\times$ E. 233 (= 'Mme. Chereau' $\times$ 'Mrs. H. Darwin'), 66 seeds germinated, 58 flowered, 8 died unflowered.

Type and Colour of Flowers.	Beard.	Leaves.
(N) 24	(T) 27	(C) 47
(V) 32 (and two intermediate)	(Y) 31*	(G) 16

The tipping of the beard in Plicatas has always seemed to me to be different from the tipping in Amcenas and Variegatas (and is perhaps derived from some other source), and the introduction of Plicata into the cross G. 187 might have been expected to give distinct results. For even though in the seedling used (E. 233) the beard was not tipped, this character was probably contained latent or recessive. The results are, however, comparable with those of G. 190, where the tipping character (from 'Cordelia') is also introduced as a recessive in the seedling C. 8. a., and these two crosses have different results for this character, both from G. 189—where there is presumably less of this character (if due to cumulative factors) in the parentage—and from G. 188, where there is more. These considerations seem to point, as I have suggested, to cumulative factors.

* Six of the thirty-one were slightly tipped.†

† Of the beards noted as being slightly tipped many had literally only half-a-dozen hairs tipped and only to be detected with a lens.

ANNUAL REPORT OF CONSULTING CHEMIST FOR 1919.

By DR. J. A. VOELCKER, M.A., F.I.S., F.I.C.

TWENTY-NINE samples were submitted in 1919 by Fellows of the Society for analysis. As usual, the majority of these, viz., 17, were of soils, 2 being waters, 4 fertilizers of different kinds, 2 lime, and the remaining 4, miscellaneous materials.

It is satisfactory to find that the reports on soils appear to be appreciated, and it is believed that useful guidance has been afforded by them. There has been a tendency of late years to decry the utility of soil analyses, but I have always maintained that, in capable hands, a soil analysis, rightly interpreted, can afford real information, and it is certainly well that a man should know what his soil contains, and whether it be lacking in any particular constituent, so that he may pursue a course of manuring or treatment appropriate and economical. I am far from claiming that all that one requires is to be furnished with the analysis of a soil, for there are other features, such as the mechanical and physical conditions, which have to be taken into account also; but the expert, conversant with his subject, will not omit to consider these other points also.

1. *Manures*.—Of the four samples sent, one was of phospho-guano, which contained 16.71 per cent. of phosphate of lime, with 3.81 per cent. of ammonia. A second was cake-dust (coco-nut), this having 71.33 per cent. of organic matter, 2.97 per cent. of phosphate of lime and 4.26 per cent. of ammonia. The third was one of shoddy manure, this containing 4.32 per cent. of ammonia.

The fourth sample was ground fowl manure, the analysis being :

	per cent.
Moisture	17.51
*Organic matter and salts of ammonia	57.06
**Phosphoric acid	1.78
Lime	3.44
Magnesia, alkalis, &c.	7.07
Sand	13.14
	100.00
*containing nitrogen	2.62
equal to ammonia	3.18
**equal to phosphate of lime	3.89

This had been collected at the Member's own farm, and was dried and ground by him for use in fruit-growing. This was only a moderate sample, and I have had others analysing considerably higher, viz. up to 6 per cent. of ammonia and 8 per cent. of phosphates.

2. *Lime, Ground Oyster Shells, &c.*—The need of liming land has been very much brought out in recent years, and lime is undoubtedly the constituent generally found lacking in soils. With the ploughing

up of so much grass land and the extension of corn-growing, this need has been much emphasized. It is well, therefore, to see to it that the lime purchased is of good quality, for it costs just as much to bring bad material as good from a distance. Unfortunately, lime is not one of the articles included under the Fertilizers &c. Act, and hence there is not the obligation on the vendor to sell lime with a guarantee.

The purchaser, however, will do well not to buy unless he has a guarantee given him, and cases are not infrequent in which an inferior lime has been purchased. Such was the following :—

	per cent.
Oxide of iron and alumina	1·39
Lime	58·44
Silica	3·37
Alkalis, magnesia, &c.	1·32
Water and carbonic acid	35·48
	100·00

This, though originally it may have been quite a good lime, having no great quantity of oxide of iron, silica, or magnesia, had become—probably by exposure—largely hydrated, and only showed 58·44 per cent. of lime (CaO); whereas a fresh, well-burnt sample would give quite 80 per cent. The sample in question was of Old Radnor (Herefordshire) lime.

The second sample sent for liming purposes was one of siftings from ground oyster shells, and gave the following analysis :—

	per cent.
Moisture	2·23
*Organic matter	2·03
Oxide of iron and alumina	·51
**Lime	47·66
Phosphoric acid	·38
Alkalis, carbonic acid &c.	39·60
Silica	7·59
	100·00
*Containing nitrogen;	·27
equal to ammonia	·33
**Equal to carbonate of lime	85·11

This was quite good for the purpose, but, being charged at £5 a ton, was far too dear, when compared with lime or even ordinary chalk.

3. *Spice*.—One sample of feeding material was sent me. This was a "Poultry Spice," and I found it to have, as its base, oat-husk finely ground, salt, fenugreek and other condiments, and also a certain amount of ferrous carbonate.

4. *Powders for killing wireworm &c.*—Two such were sent me; the one proved to be simply crushed mustard seed, which was very pungent; the other was a product containing naphthalene, crude tar bodies, &c., absorbed in brick-dust and earth.

5. *Suction-gas waste*.—A sample was sent me in order to see if

the refuse obtained from suction-gas plant had any manurial value. It gave the following analysis :—

	per cent.
Moisture	15.70
Oxide of iron and alumina	2.69
Lime	4.39
*Phosphoric acid	.89
Silica	1.91
Carbonic acid &c.	4.66
Carbonaceous matter	69.76
	100.00
*equal to phosphate of lime	1.94

Beyond the small amounts of phosphate of lime and lime (as carbonate), there was nothing of manurial value in this. It would do, however, for mixing with, and diluting, artificial manures.

6. *Waters*.—The two samples sent me were from the same place. the one from a pump in the house, the other from a supply in the garden. Both were quite soft, the garden one specially so, as it contained only 5 grains per gallon of total solids, the other having 12.04 grains. They were both free from polluting matter.

7. *Soils*.—The 17 samples of soil sent came, of course, from various sources, and were intended for hop-growing, fruit trees, and garden purposes generally. Those which present any special feature of interest are touched upon.

(a) *Hop soils*.—The 6 samples sent came from Kent, and were clay loams. All of them were very fairly rich. Lime was not required, and they were more than ordinarily well supplied in phosphoric acid. Potash, however, was rather deficient, nor did some of the soils contain sufficient organic matter, so that the use of farmyard manure and organic nitrogenous materials like shoddy would be advisable.

(b) *Rhododendron soil*.—A sample of soil from near Hertford, to be used for Rhododendron-growing, gave the following analysis :—

(Soil dried at 100° C.)		per cent.
Organic matter and loss on heating		11.39
Oxide of iron and alumina		10.63
Lime		.93
Alkalis &c.		1.47
Insoluble silicates and sand		75.58
		100.00

This was a heavy clay soil, containing pebbles. The amount of lime present is more than is advisable for the particular object in view, and the soil generally is not the class of soil on which one would expect rhododendrons to do well, a light, peaty sand being much preferable.

(c) *Soil for bulb-growing*.—A soil from Newbury, Berks, to be used for bulb-growing, gave the following results :

(Soil dried at 100° C.)

	per cent.
Organic matter and loss on heating	18.38
Oxide of iron	1.36
Alumina	2.53
Lime	21.46
Magnesia	.33
Potash	.16
Soda	.18
Phosphoric acid	.35
Sulphuric acid	.07
*Carbonic acid	15.72
Insoluble silicates and sand	39.46
	100.00
Nitrogen	.745
*equal to carbonate of lime	35.72

As the analysis indicates, this soil had a great deal of chalk in it. The top surface, however, was light and peaty, and was able to retain moisture. A soil containing so much lime is not one generally suitable for bulb-growing, and a peaty sand would be better. Many Lilies, Colchicum, and Crocus prefer a light, peaty, and sandy soil, though some kinds of Crocus will grow on any soil. Narcissus, too, is not particular, and will do even on stiff clay soils. The soil was particularly well supplied in phosphoric acid, and was distinctly rich in nitrogen.

(d) Garden soils.—The following analyses, A–D, are those of soils examined for the purpose of ascertaining their suitability as garden soils :—

(Soils dried at 100° C.)

	A	B	C	D	E Agri- cultural soil.
	per cent.	per cent.	per cent.	per cent.	per cent.
Organic matter and loss on heating	4.63	8.55	5.36	6.89	1.39
Oxide of iron	2.98	5.20	5.10	4.35	1.56
Alumina	3.54	6.42	5.82	4.27	1.27
Lime	.53	.60	.56	4.81	.23
Magnesia	.63	.76	.66	.73	.29
Potash	.25	.60	.27	.28	.10
Soda	.17	.32	.23	.24	.10
Phosphoric acid	.30	.23	.23	.31	.15
Sulphuric acid	.06	.01	.02	.08	.11
Carbonic acid	—	—	—	3.13	—
Insoluble silicates and sand	86.91	77.31	81.75	74.91	94.80
	100.00	100.00	100.00	100.00	100.00
Nitrogen	.210	.357	.170	.294	.103

A, B, and C are, alike, instances of soils in which magnesia is in excess of the lime present, and, in such cases, as I have pointed out before, the application of lime is desirable. In other respects the three soils are not unsatisfactory, each containing quite a fair pro-

portion of phosphoric acid, and, probably, sufficient potash. For garden soils, A and C, however, would be better for more organic matter and nitrogen, such as farmyard manure would supply. The comparison of C and D is interesting, inasmuch as both come from the same place. C is soil that has not been cultivated, but D has, and it has also, no doubt, received applications of lime and farmyard manure. Its superiority in organic matter, lime, phosphoric acid, and nitrogen is clearly marked.

(e) Agricultural land.--E in the foregoing table is the analysis of a soil from a farm in Hampshire. It was a light, sandy loam of reddish colour, with subsoil of sand, and the analysis showed it to be of very poor character, though a very easy one to cultivate. Its chief wants are organic matter and lime, and, on such a soil, little good can be done without liming.

In addition to the above, there was one consultation in regard to the use of lime or of chalk, and also an inquiry respecting a supposed case of damage to yew trees through the application of weed killers or other destructive agents. The examination of the soils gave, however, no indication of anything harmful having been put on the soil.

ON THE RELATION OF BOTANY TO SCIENCE IN GENERAL.

By Professor A. W. BICKERTON, A.R.S.M. &c.

[Read July 29, 1919; Mr. F. J. CHITTENDEN, V.M.H., in the Chair.]

ONE serious, almost fatal, defect of modern science is lack of correlation amongst eminent specialists; this has always characterized the past, and still lasts into this twentieth century.

Expert specialists seem to work in thought-tight boxes, and know but little of one another's researches. The cost of this neglect is very great. Basic principles almost always wait for something like half a century before they are used. Mendel's great discovery was not used until the twentieth century. It is estimated that, in the growth of grain alone, the world would be richer by at least a hundred millions sterling a year, had full advantage been taken of this remarkable principle from the date of its discovery.

In meteorology, in astronomy, in geology and physics, examples of the same neglect reach in many cases up to the present.

It seems to me to be the especial duty of botanists to help to remove this flaw. Botany is, as it were, in the middle of the sciences. It depends on astronomy, chemistry, physics, and leads up to zoology and sociology. No person can be a basic botanist, especially if we include palæo-botany, without understanding the dynamics of the solar system. The botanist needs to be quite well versed in many branches of physics. Whilst chemistry lies at the very root of the science, it happens that the highest branch of chemistry, bio-chemistry, is intimately associated with plant life.

Specialization is the very life-blood of progress; but the worker at a leaf of the tree of science should know how his work is connected with twigs, branches, stem, and roots. Very frequently he does not know, or his ideas of the connexion are extremely vague. This is vicious specialization, and it has had a most malignant influence on human progress. Vast masses of uncorrelated lumber accumulate, and stand in the way of progress. There is also a tendency to teach special branches of technical science without a basic knowledge of general principles. The foundation of science for most technical work is the same. There is scarcely a branch of science, or even of industry, for which the chemistry of a candle, as given by Faraday in his lectures, is not equally useful.

One reason for this vicious specialization is that it is profitable. The expert specialist is well paid in all branches, and especially is this so in medicine; yet here width of knowledge is of extreme importance to general well-being, as the removing of some specific defect may lay the foundation of deep-seated future calamity.

In ancient Egypt specialization was carried so far, it is said, that it was a criminal offence for the ear doctor to treat the throat; yet deafness has often a throat origin.

There are hopeful signs of broadening in science. The modern engineer needs to be very widely trained; radio-activity demands an extended knowledge; wireless telegraphy, and flight, depend on a wide range of principles. Still, I feel it is upon botany that we must depend for broad and basic generalizations. Recently attention has been called to the coal mines of Spitzbergen, and our Antarctic explorers found coal in several places in their wanderings. How came coal in such cold quarters? Have we any intelligible theory of the ice ages, or any clear comprehension of why the seasons should differ so much in any given place from year to year? Why is it that for years there is scarcely any ice on the Thames, and another year it may be frozen over so hard that a dray may pass? Fertile suggestions to account for all these peculiarities are offered, dependent on absolutely definite astronomical, physical and geological facts; but there is no scientific organization to attempt to correlate them. A flaw is found, and certain facts fail to agree with the theory, and the whole idea is thrown on one side; yet often the addition of one fact more would make the matter clear.

The whole of cosmic phenomena is correlated in nature—possibly a change of climate depends on floating ice, the amount of floating ice may depend on gigantic earthquake waves, the amount of the ice at the Poles may depend on an altered eccentricity of the Earth's orbit, or upon a change in the inclination of the Earth's axis. We have two theories, Croll's and Grayson's. Grayson's theory, taken alone, is quite insufficient. Yet these two theories, taken together, show how every climatic fact revealed by botanical and zoological remains might be accounted for.

In addition to the lack of interest in subjects outside their own, there is often a feeling of absolute hostility. When the physicist Bose applied his knowledge to botanical facts, he was for twelve years so ostracized that, he tells us, his life was a long tragedy.

There is no doubt that this neglect of correlation has extremely wide-reaching effects in philosophic thought, and that the whole trend of human affairs would be altered and vitally improved if basic principles were more thoroughly understood. The theory of the dissipation of energy has had a most depressing effect upon human thought, and yet it is almost certain that it is not of cosmic application. The physical possibility of the eternal life of the cosmos is believed to be demonstrated, but it depends on so many nice points, in so many sciences, that it is not yet commonly accepted.

For over forty years the dismal doctrine of eternal death has been clearly shown to have no basis in fact. This pessimistic doctrine has influenced the theory of evolution, and given a wrong trend to the doctrine of human ascent, which it is believed is dependent on the persistence of the fittest fighter. The latest researches seem to

show that human evolution has depended on the persistence of the fittest group, instead of the fittest individual; that coherent solidarity, mutual aid, and group altruism have been the factors that have developed the divine in man and evolved *Homo sapiens*. The current ideas of the success of the ruthless dynast and fittest fighter are certainly wrong. Frightfulness may have played its part in the evolution of the predatory brute and venomous serpent. It had but little to do with the origin of humanity.

WART DISEASE OF POTATOS.
(*Synchytrium endobioticum*, Perc.)

A STUDY OF ITS HISTORY, DISTRIBUTION, AND THE DISCOVERY OF
IMMUNITY.

By GEO. C. GOUGH, A.R.C.Sc., B.Sc.

EARLY HISTORY.

THE early history of Wart Disease and the onset of the disease in the British Isles are points which raise many interesting questions. That it was introduced and is not indigenous seems probable, although it is possible that the causal organism (*Synchytrium endobioticum*) may be a parasite on some wild plant without producing any deformation which would call attention to it. It should be remembered that this fungus has only been found on *Solanum nigrum* and *S. Dulcamara* in pot experiments (21)* and not in nature, and that even in such cases its presence is not very obvious macroscopically. It is therefore quite possible, although not probable, that the fungus may be indigenous and has only adapted itself to the potato during the last sixty years.

If the fungus has been introduced, the question arises whence? As far as our present knowledge goes, the British Isles have more of the disease than any other country. It is commonly stated in certain districts that it was introduced from Germany, and it is even called the German Wart in some parts. This statement has little foundation, as, while it is undoubtedly spreading in Germany, and the authorities there are faced by the same problems as we are in Britain, there is little evidence that it was in the fields until quite recently, although it is reported as having been in a field at Kronenberg in 1907 (70). Luxemburg, Belgium (verbal reports), and Holland (60) have it, but it is not apparently of long standing, while it has been reported from Norway (75) and Sweden (24). France is said to be free, although Gussow (28) some years ago incorrectly reported it there.

It could hardly have come with the original potato, as *Solanum Commersonii* and *S. tuberosum* appear to be immune, while certain Chilian varieties, which Mr. MALTHOUSE (46) of Harper Adams College tested, also proved immune. If it had been so, it would have made its presence felt at an earlier period.

The earliest scientific record of the disease was made by SCHILBERSZKY in Hungary (72), who named the organism causing the disease *Chrysophlyctis endobiotica*. This was in 1896, but no informa-

* Numbers in brackets denote the references in bibliography at the end.

tion is available as to its presence in Hungary itself. Communications some years ago to Professor SCHILBERSZKY, who held the chair of Botany at the Royal Hungarian Horticultural College, Budapest, elicited no reply, but the Secretary of the National Hungarian Agricultural Society of that time did not know of the disease being prevalent in Hungary. Although it was undoubtedly present in England before this time, it is interesting that one of the earliest definite statements I have got is from Messrs. SUTTON to the effect that they first received a specimen in July 1898 from the late Mr. W. KERR of Dumfries. It came from near Birkenhead, and was grown from "seed" (variety 'Imperator') from Hungary! A photograph appears in Mr. A. W. SUTTON's paper on "The Potato" in the *Jour. R.A.S.E.* for 1898, p. 599; but the disease was not recognized, and it was called "rust." * While it is not possible that this "seed" was the means of introducing the disease into England—for a number of persons had told me they had had the disease twenty years before—it is significant that it is in this district that personal records go back furthest, and quite definite statements have been made as to its occurrence and character in the 'eighties. Mr. W. NIELD, of Holmes Chapel Agricultural College, informed Mr. SALMON (64) that he first heard of it in 1895, and it was generally believed in Cheshire that it had been introduced into this country by the cattle boats arriving at Birkenhead. Mr. YOUNG, the Principal of the College, has stated that it was known in Cheshire as far back as 1890. Dr. MCDUGALL (38) mentions that it was first brought to his notice in 1899 amongst potatoes from Cheshire farms grown from new seed. It was noticed at Burton-on-Trent in an allotment the same year. Professor NEWSTEAD stated that he remembers seeing it at Upwell, near Wisbech, in 1878. If it was so it is curious that this district is now one of the cleanest in the country as regards Wart Disease.

In the Birmingham district Mr. A. L. WELLS informs me it occurred thirty years ago in a garden, and was found in fields there many years ago. It also made an early appearance in Lancashire, for in 1909 five farmers, in a letter to the *Ormskirk Advertiser*, stated it was known in cottage gardens fifty years before. While it is not advisable to accept without reserve statements made as to the presence of a disease many years before by non-scientific persons, Wart Disease is so characteristic that, except in its earlier stages when corky scab may be confused with it, one may place more reliance than usual on such statements.

The earliest published record of its appearance in Scotland that I have is one by the late Doctor WILSON (88), who gave a description, with photographs, of the disease. He records it as having been sent him from Colinsburgh, Fife, in September 1901. It must have been present many years, for eleven years back many gardens in Fife were full of disease. My colleague, Mr. G. P. BERRY, tells me that Mr.

* In the *Jour. of Hort.*, Dec. 15, 1898, the late Mr. ABBEY had an article on a potato disease which from the illustration is evidently Wart Disease.

W. DAVIE, of Haddington, informed him a few years ago that he remembered the disease being in his garden as far back as 1876; and a relative of Mr. BERRY, now a very old man, can remember it in a garden in the same town quite as far back. This is about the date, I believe from my inquiries of various people, that it appeared first in Cheshire. Professor BRYNER JONES recorded it from Wales in 1901, but it was not found in Ireland till October 1908.

It was therefore well established in village gardens and allotments long before the scientific world had heard of it, and my experience with some other so-called recently introduced diseases leads me to believe that they had become established in the country some years before any mycologist had seen them.

It was not until about 1907 that the disease began to cause any general concern. Certain mycologists who had seen the disease recognized its possibilities as a destructive pest, but growers, even when it was present in their district, derided the idea of its being the cause of any loss to the commercial grower, and the reply that the land was "potato sick" owing to the constant cropping of gardens and allotments with potatoes was thought generally to be sufficient. The number of specimens received by the Board of Agriculture and Fisheries for diagnosis increased greatly during that year, and it became obvious that the disease was extending its limit and increasing in intensity. Very little was known of it beyond the name of the organism associated with it, and nothing as to its means of spread, or remedies for it. The Board could only give general advice on cultivation, and suggested the use of sulphur and keeping the land free from potatoes for a year or two.

The passing of the Destructive Insects and Pests Act in 1907, however, enabled the Board to appoint technical inspectors, but it was too late that year to do anything very definite. In 1908 the writer was requested to undertake an inquiry into the nature and extent of the disease. A list was made of all the known cases and the correspondents visited and interviewed. They were of all classes—gardeners, scientists, farmers, and allotment holders.

It was soon ascertained that in certain counties, especially Lancashire, Cheshire, and Staffordshire, the disease was widespread, severe, and of long standing. It had also obtained an entrance into the fields; but farmers, as already mentioned, refused to believe it to be serious. As the writer pointed out to them, they were working on a rotation and had given the fungus little opportunity to spread; but their statements made it obvious that where they had seen it twice in the same field it was worse the second time. Certain farmers, however, took very gloomy views, as they had infected many of their fields by means of manure, and this proved to be one of the quickest means of spreading the disease locally.

One of the first to be interviewed was Mr. H. S. DAINE, of Mouldsworth, Cheshire. He had become interested in the disease because two or three cottage gardens near by were badly infected. The

occupiers of these told him that the only variety they could grow was 'Snowdrop,' which was not attacked, although all other varieties suffered in their soil. I interviewed Mr. SWINDELL and Mr. DERRY and found that their soil was undoubtedly infected. Mr. SWINDELL informed me that as far back as 1894 he had scarcely a sound root in his garden, and that he grassed down a portion for five years only to find the disease present when he again planted potatoes. Both he and his neighbour, however, could get clean crops of 'Snowdrop.' He had tried quicklime, soot, and the usual remedies for disease without success. As a result of these statements I made special inquiries of others as to varieties free from attack, and was given various names, especially "earlies"—which are not attacked before lifting unless ground is very badly infected. In other cases I found supposed resistance was due to the fact that the ground was unequally or very slightly infected, but by a process of exclusion, owing to positive evidence of its presence on many of the varieties growers considered immune, I came to the conclusion that 'Snowdrop,' 'Conquest,' 'Golden Wonder,' and 'Langworthy' were immune, or practically so. What doubt there was, was due to occasional statements that slight warts had been seen on some of the varieties, but we know now that such warts were either on "rogues" or were due to Corky Scab (*Spongospora subterranea*).

As a result of these and many other interviews with men who had had the disease in their crops for years, and the sifting of scores of statements, the following facts were ascertained, most of which were incorporated into Leaflet 105 of the Board of Agriculture (1):—

- (1) The disease was serious and infected the soil.
- (2) None of the ordinary remedies, lime, soot, salt, was of any avail. Deep cultivation and the deep burial of the top spit was useless.
- (3) Plots grassed down for six years still produced diseased potatoes when they were planted again.
- (4) The spores of the fungus passed through animals unchanged and were spread with the manure.
- (5) Certain varieties, 'Conquest,' 'Snowdrop,' 'Golden Wonder,' and 'Langworthy' resisted the disease, although 'Up-to-Date' growing alongside suffered severely.
- (6) Disease was spread by infected "seed" and manure, and Scotch "seed" was not above suspicion.

The Board (4) on receipt of this report resolved to have trials the following season (1909) to confirm the observations, and requested the Lancashire County Council (through their Education Committee), the Harper Adams Agricultural College, Shropshire, and the Holmes Chapel Agricultural College, Cheshire, to carry out a series of trials in infected land.

Three sets of trials were arranged by the Lancashire County Council and one each by the two colleges. In Lancashire two trials were on infected fields, one near Ormskirk, one near Manchester, while the third was carried out in the grounds of the Ormskirk Workhouse,

which even then were badly infected. These same grounds have been used for the Board's trials since 1915. In Shropshire a number of adjoining infected gardens were used; in Cheshire a badly infected field.

All the trials were similar, and consisted of

- (1) Variety trials for immunity,
- (2) The testing of possible remedies.

Of the latter it may be said at once that no substance tried then or since has proved a remedy (3), (46), (70), (71), (72). The common remedies—lime, salt, sulphur, soot, &c.—by themselves and in various combinations were tried, as well as chemicals which theoretically might prove a cure. ERIKSSON (25) reported that he had killed the "contagious matter in the soil" by means of formalin. This had been tried previously in England, and after his report it was again tried, but the next crop of potatoes was badly attacked. As regards the variety trials, nearly all the well-known varieties, such as 'King Edward,' 'Up-to-Date,' 'Epicure,' 'Evergood,' &c., were found to take the disease, but the following were free from it, thus confirming the immunity: 'Langworthy' ('What's Wanted'), 'Golden Wonder,' 'Abundance,' 'Conquest,' and 'Snowdrop.' Rogues in these varieties were found to be attacked.

In 1909 flowers of sulphur, which had been reported on favourably as a cure by a number of people, was also tried by presenting sufficient of the material to test it to cottagers with infected land. Unfortunately, in no case was there less disease present, but many of the recipients reported that the sulphur acted as a manure, and that treated rows gave heavier crops than untreated rows.

The immunity tests were repeated in 1910 (5) with additional varieties, and as a result the immunity of the above varieties was confirmed and others were found resistant. These were 'Aberlady Early,' 'Southern Queen,' 'Favourite,' 'Supreme,' 'Crofter,' 'Laird,' 'Provost,' 'White City,' and 'Peacemaker.'

Elsewhere 'Champion,' 'St. Malo Kidney,' 'Rector,' and 'Schoolmaster' were also reported as immune.

The same season (1910) the Board distributed to centres selected by the author small lots of 'Conquest,' 'Langworthy,' and 'Golden Wonder' for planting by cottagers and allotment holders in infected soil, as it was felt that the results of experiments on scientific lines might be different when carried out in small gardens. These varieties under these conditions proved to be resistant and gave satisfaction to many who previously could not grow potatoes in their gardens owing to the serious infection of their soil.

The Board of Agriculture did not initiate further experiments after 1910, but in 1911 and 1912 Mr. MALTHOUSE of the Harper Adams College was assisted by a grant from the Board and continued both variety and fungicide experiments, greatly increasing the list of potatoes resistant to the disease. A full account is given in the College Bulletin 8 (46), but it may be mentioned here that French, German,

and Chilian varieties were tested as well as *Solanum Commersonii* and *S. elaeagnifolium*. The Chilian varieties and some of the French and German varieties proved immune, as did the two species mentioned. None, however, appeared to be of much commercial value.

In 1915 Mr. SNELL (77), who was appointed an inspector of the Board in 1913, and was stationed at Preston, started, in conjunction with the Lancashire Farmers' Association, a series of semi-official trials in the grounds of Ormskirk Poor Law Institution, already mentioned as being the scene of the earlier trials conducted by the Lancashire Education Committee. From this what are now known as the Ormskirk Trials have arisen, and most of the well-known varieties of potatoes have been tested there. A full account of the trials up to 1918 is given in the Supplement to the Journal of the Board, issued March 1919 (78).

The following varieties have been confirmed as immune since 1909 either by Mr. SNELL (78), by Mr. MALTHOUSE (46), in Germany by WERTH (87), or in America (47). Mr. MALTHOUSE reported a few other varieties immune, but some of these have either not been tried elsewhere or have since proved to be susceptible, as the soil on which Mr. MALTHOUSE conducted his trials was not uniformly infected. As far as possible synonyms have been deleted, especially in the 'Abundance' Group. There are some thirteen other German varieties which have come through many tests immune, but have shown a few warts in one or two trials, probably on rogues in the stocks.

EARLY VARIETIES.

A1 (Sutton).	Dargill Early (Gardiner) (a selected stock of Boston Kidney).
America (Dobbie).	Edzell Blue (Herd).
Arran Rose (McKelvie).	Milecross Early.
Ashleaf (Broadleaf) or Ashleaf (Sutton).	Juli (Paulsen).
Boston Kidney.	Snowdrop (Perkins).
Coronation (Gardiner).	

SECOND EARLY VARIETIES.

Aberlady Early.	Entente Cordiale (Findlay).
Adirondack.	Great Scot (McAlister).
Ally (McKelvie).	Jubelkartoffel (Richter).
Arran Comrade (McKelvie).	King George.
Border Queen.	Mauve Queen.
Cardinal.	Mr. Bresse.
Climax or The Towse.	Schoolmaster (Turner).
Conquest (Findlay).	Southern Queen.
Crimson Beauty.	The Dean.
Duchess (Dobbie).	The Duchess.
Early Market (Sutton).	

MAINCROP VARIETIES.

Abundance (Sutton) (with very many synonyms).	Five Mile Town (Carter).
Arran Victory (McKelvie).	Flourball (Sutton).
Bishop (Wilson).	Irish Chieftain (McKenna).
Burnhouse Beauty.	Irish Strain (Strain).
Champion (Nicoll).	Irish Cobbler K. of K. (Findlay).
Clan Alpine (S. T. Farish).	Kerr's Pink or Henry Seedling (Henry).
Dominion (Poad).	King of the Russets (Carter).
	Langworthy (Niven).

Leinster Wonder (Williamson).	Rose 4.
Linda (Gardiner).	Shamrock.
Majestic (Findlay).	St. Malo Kidney.
Nithsdale.	Supreme (Sutton).
Paragon.	Templar (Wilson).
Peacemaker (Scarlett) or Golden Wonder (Brown).	The Laird (Davie).
Rector (Wilson).	The Lochar (Farish).
Rhoderic Dhu (Farish).	Tinwald Perfection (Farish).
	White City (Sutton).

It is interesting to note that experiments in Germany are being tried on similar lines to those carried out in England. The fungicide experiments have given negative results, but the immunity trials have shown that certain German varieties are immune. The latest publication (87) only mentions two varieties as being completely immune, but a number are mentioned as being very slightly susceptible in some of the trials. In all probability disease in such cases was present on rogues as in the early English trials. Such varieties when properly rogued showed no sign of warts.

Outside Europe, Wart Disease has only been found in the United States of America. It was discovered in September 1918 in three counties in eastern Pennsylvania, while it has since been found in West Virginia (47). It is believed to have been imported from Europe in 1912 with eating potatoes of an inferior quality. The United States of America authorities are engaged in an extensive survey with a view to limiting its distribution, and are testing their varieties for immunity. Already it has been ascertained that several of the most important of their varieties are apparently immune, and they are also importing immune varieties from the British Isles with a view to testing these in American infected soil.

A few words on the common names of the disease may not be out of place.

There is naturally no history of such names as "Cauliflower Disease," "Fungus," "Canker," &c., which are mere local names. The term "Black Scab" appears, however, to be used first by MASSEE in his paper in 1902 (48), and this and "New Potato Disease" were the names commonly used up to 1908. In 1908, when more became known of the disease, and it was obviously neither black nor a scab, the Board commenced to use the term "Wart Disease," and this appears officially in the leaflet issued in September 1908. Previous to this SALMON had called it "Warty Disease" in his paper in *Gardeners' Chronicle*, December 7, 1907. Still earlier it had been referred to in an Agricultural column of the *Standard* of August 30, 1906, as "Yellow Wart Disease," while in a later issue of the same paper (*Standard*, October 11, 1906) the Board of Agriculture was taken to task for persisting in terming the disease "Black Scab" and stating that it was commonly known amongst growers as "Yellow Wart Disease." PERCIVAL (56) pointed out that Black Scab was misleading, and suggested "Potato Wart" instead.

Since 1908, the term Wart Disease has come into common use, and is used in all official documents.

APPEARANCE OF THE DISEASE.

A badly infected plant at first sight presents no uncommon feature unless it be that the plant looks stronger than its fellows. On moving aside the shoots, however, a corrugated or spongy mass of yellowish-green tissue (the colour varying with the amount of chlorophyll developed) may be found arising from the stems near or under the surface of the ground. Inspection of many specimens reveals the fact that the mass is a modified leaf, and all stages of it may be found, from the mere wart to the unaltered leaf, or a warty mass with leaf-like outline. The author once found part of the inflorescence infected. In such cases infection has taken place when the shoot has pushed its way through the infected soil, or the leaf has lain on it, and there is no evidence that the fungus can make its way through the stem. These surface masses are easily seen in late July and August, but after that time they frequently rot, releasing the sporangia and leaving only a dark shell, which is not very obvious. On lifting the plant some or all of the tubers are seen to have similar outgrowths, but the colour is that of the skin of the potato, although it varies with the distance from the light, while tubers growing near the surface may push the warts outside, which thereupon develop chlorophyll and become green. A series of specimens will show that the warts arise in the bud or eye of the tuber and they often become leaf-like. The intensity of the infection depends to some extent on the amount of water in the soil, and in a dry season tubers may be found with few or no warts, and the haulm may be unaffected, although it may be known that the soil is thoroughly infected. The disease is not confined to any particular soil—sandy and clayey soils or medium loams all give rise to diseased plants if infection has been introduced.

CAUSE OF THE DISEASE.

An examination with a pocket lens of the cut surface of a wart shows reddish-brown lines just under the skin, and these are seen to consist of numerous reddish-brown bodies. Under the microscope these bodies, which the researches of JOHNSON (33) and PERCIVAL (56, 57) have shown to be sporangia, vary from 30–70 μ in diameter, and have thick dark brown walls, which are ridged and in certain views look angular. These are the so-called "resting spores," and are released into the soil when the warty masses rot. As already mentioned, the organism was first recognized by SCHILBERSZKY (72) in specimens from Upper Hungary, and he named it *Chrysophlyctis endobiotica*. In England it first came under scientific notice when M. C. COOKE (15, 16), CARRUTHERS (3), MASSEE (48), POTTER (58), received specimens, and a controversy arose as to its identity with SCHILBERSZKY's organism. The details are given in full in HORNE's paper (31), but the name stood until PERCIVAL (56) came to the conclusion that the organism belonged to genus *Synchytrium* and the

name now given is *S. endobioticum* Perc. Later, BEHLA (10) worked out the life-history, and more recently Miss CURTIS (22) has recorded that sporangia continue development after decay of the host and give rise to numerous uniciliate zoospores, which, after a period of motion, enter the epidermal cells of any actively dividing region. Presumably there is a resting period in the soil before these zoospores are liberated. In view of the fact that these sporangia are known to lie in the soil for at least 10 years, the question arises as to their state during this time and the conditions which cause their rupture. At present we have no evidence, but it seems probable that some secretion of the potato plant is necessary for germination, or during the years in which no potatoes are grown germination would take place and zoospores would die of starvation.

Miss CURTIS's paper reveals the fact that sori are formed from which facultative gametes are liberated. These gametes may infect the host directly, giving rise to other sori (JOHNSON's summer sporangia), and this process may go on several times during the growing season, as it only takes about three weeks. On the other hand, fusion of gametes may take place and a zygote be formed. Infection by a zygote which becomes uninucleate will give rise to a resting sporangium, but this process takes months. ORTON and KERN (55) also describe the entrance of the parasite into the host cell, and infer there is a special attraction of the parasite to the host nucleus.

SPREAD OF THE DISEASE.

It is obvious, from the early history of the disease which has been dealt with previously, that the disease can be carried by infected seed. It is known that tubers from an infected plant which are apparently quite healthy may bear the sporangia, and these release their zoospores into the soil. Any growing plant within the range of the zoospores therefore becomes infected and sori are formed, the process being continued throughout the growing season if soil conditions are favourable. Fresh districts become infected by "seed," but the disease is spread locally by want of care in the use of tools and implements, and chiefly by feeding diseased material to animals, especially cows and pigs. In the early days of Wart Disease case after case of whole fields being spoilt by infected manure came to the notice of the authorities, as the resting sporangia passed through the animals unchanged. Although not wind-borne, doubtless cases have occurred where the spread of the disease was caused by pheasants and crows, which are fond of pecking at the warty mass between the haulms, dropping sporangia with their excreta.

The slow spread of the disease in its early days is a matter of surprise to some persons. It must be understood, however, that the idea of change of "seed" had only recently become generally accepted and the disease spread very slowly and locally in its early stages, as it was then outside the usual "seed"-growing districts. When it

got into these its spread was much more rapid. Even then it was not so rapid as now, for, speaking generally, the farmer who got infected "seed" only had isolated infected plants, and with a four-year rotation it was eight or twelve years before the disease would attract serious attention, and he would continue to supply local growers without spreading infection to any extent. Of recent years, what with the increased infection of fields, both in England and Scotland, and the greatly increased demand for change of "seed," especially from the North, where it is worst, Wart Disease has had every opportunity for dissemination. During the war, when the usual methods of transport were upset, and especially in the spring of 1917, when there was a shortage of both "seed" and ware potatoes, not only did "seed" potatoes come from infected districts into clean, but potatoes from infected districts were used for "seed," and this increased the number of infections in the South, which hitherto had been exceptionally free.

EXTENT OF THE DISEASE.

The disease has now been recorded from every county in England except Suffolk and Cornwall, but East Anglia and Lincolnshire have few cases, and the South of England generally is but slightly infected. The Midlands, north-western counties, and Wales are badly infected. Scotland has a considerable amount of the disease, especially in Mid-Scotland and the South, but the northern counties appear to be free. Ireland is free but for a small district in the southern part of County Down. Its presence on the Continent and in America has already been mentioned.

FUTURE OF THE DISEASE AND THE POTATO INDUSTRY.

The present extent of the disease and the fact that, notwithstanding the efforts of the Ministry of Agriculture, the fungus is obviously spreading, show that the future of the potato industry is imperilled. Thousands of acres are infected, not necessarily badly, although there are scores of fields where a profitable crop of susceptible varieties cannot be grown, and it is only a question of a few years before all are so infected with sporangia that they will be useless for the growing of what are now the popular varieties. With no remedy to hand at present—and if there were, the probability is that it could not be supplied in sufficiently large quantities to eradicate the fungus—it is obvious that the breeding and selection of immune varieties must be continued, so that the present susceptible varieties will gradually die out and be replaced by those that prove immune. Up to the present no variety which has been certified as immune by the Ministry of Agriculture has taken the disease, the reported cases when investigated having been proved to be "rogues" or wrongly named varieties. As both in England and Germany (72) reinfection of the potato occurs at least nine years after the last crop of potatoes, not only

is it necessary to know how long it takes to starve out the sporangia where no potatoes are grown, but also to see if the growing of immune varieties starves them out sooner by causing them to germinate more quickly. Experience may show that it is quicker to get rid of infection by growing immune varieties than to keep the land free from potatoes, while it is certainly easier and allows the maximum of food to be produced.

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SILVER-LEAF DISEASE.

[So widespread and disastrous in its effects, especially upon stone-fruit trees, is the silver-leaf disease, and so many requests for information concerning it are received, that the Council of the Royal Horticultural Society has caused the following account of it to be drawn up for the information of the Fellows, and it appeals to them to do their best to check the spread of the disease by adopting the measures recommended.]

Symptoms of the Silver-leaf Disease.—Except in the case of ever-green trees, silver-leaf is not easy to detect in winter. In summer the curious leaden or silvery appearance of the foliage of the diseased parts of trees contrasts conspicuously with the normal green of the healthy foliage and renders the disease easy of detection. The diseased leaves are usually of normal shape and size. If a diseased leaf be examined carefully it will be found that the upper skin (epidermis) readily separates from the green cells beneath and is easily peeled off. The wood of the diseased branch is stained brown to a greater or less extent. The simultaneous presence of these three symptoms serves to separate the common true silver-leaf from those rarer cases where a somewhat similar silveriness of foliage is produced by some less serious cause. In false silver-leaf neither of the last two symptoms is as a rule present. The silver tinge of the leaves is due to the presence of large air-spaces beneath the epidermis, where the latter has become separated from the green cells which form the bulk of the leaf.

The Serious Nature of the Disease.—Trees or branches attacked by the silver-leaf disease may live for some years, but they rarely flower or fruit, or when they flower abundantly the fruit is inferior. They very rarely recover their health, and eventually die prematurely. In bad cases death may occur within a year. When dead the branches are a menace to all other fruit-trees in their neighbourhood.

Trees Liable to the Disease.—The disease is most frequent upon trees belonging to the plum and cherry tribe. It is doubtful whether any variety of plum is proof against its attacks, although it is less frequent upon the 'Pershire' or 'Egg Plum' than upon most. 'Victoria' is the most frequent victim, but 'Pond's Seedling' is often attacked. Sweet and acid Cherries, Peaches and Nectarines, Apricots, Almonds, Sloe, *Prunus japonica*, and *P. lusitanica* (Portugal Laurel) are known to be attacked, the last very commonly. In addition, it is on record that the following have all been attacked—Apples (e.g. 'Gascoigne's Scarlet,' 'Newton Wonder,' 'Lord Grosvenor,' 'Bramley's Seedling,' 'Lord Suffield'), Pears, *Pyrus torminalis*,

and other species of *Pyrus*, *Exochorda Alberti*, *Pyracantha Rogersiana*, *Spiraea*, *Neviusia alabamensis*, *Philadelphus*, *Ribes* sp., including Currants and Gooseberries, Laburnum, *Syringa*, Horse Chestnut, Honeysuckle, *Pernettya mucronata*. The disease, therefore, attacks an unusually wide range of plants, and it has been shown that it can be transmitted from one host to another of a totally different kind.

The Range of the Disease.—Silver-leaf has been recognized in all parts of the country (with the possible exception of Cumberland, from which county we have at present no record). It was apparently first drawn attention to by writers in France in 1885, but is now known throughout Europe. It occurs also in America, including all parts of Canada, and in Australia and New Zealand. In the south of England, especially in Middlesex, Surrey, and Kent, a large proportion of the plum orchards are badly affected.

The Cause of the Disease.—The disease is caused by the presence of a fungus, *Stereum purpureum*, in the wood of the tree. The fungus does not enter the leaf, although the most conspicuous symptoms are produced there. It grows in the wood where the brown discoloration is produced.

The Fruiting of the Fungus.—*Stereum purpureum* does not fruit on the diseased parts so long as they are alive, but soon after death the flattish purple fruits are produced upon the stem or branches, often being grouped together in fairly conspicuous masses. On the surface of the purplish growth numerous spores are produced, and it is by means of these microscopic bodies that the disease is spread.

The Infection of the Tree.—The fungus can obtain entrance into the tree only through a wound in the stem, branches, or exposed root. So far as is known, it never enters through intact bark or through the leaf. Once established in the wood it travels quickly upwards and more slowly down, but in time permeates the whole tree. Stem or root infection at once involves the whole tree; branch or twig infection, at first, only a part of the tree.

Preventive Measures.—No cure is at present known and natural recovery is rare. The value of iron sulphate which has been suggested as a remedy is at present unproven. The diseased tree or branches are a source of danger as soon as death occurs, and unprofitable during life. All diseased trees should therefore be rooted out. Diseased branches should be cut out completely below the point at which a brown discoloration is to be seen in the wood. All dead wood should be removed from all trees and bushes in or near the orchard, and all such wood, together with diseased trees and branches, should be immediately removed from the orchard and burned as soon as possible. *The fungus produces its fruits upon them.*

All wounds made in pruning, grafting, and budding should be clean and smooth and protected from the air, for *the fungus finds its way into the tree by way of such wounds*. Tar or lead paint may be used for covering wounds made in pruning, and it should be applied as soon as the wound has been made. Grafting wax may be used in

other cases. Where branches are broken or trees torn, from whatever cause, the wounds made should be cut cleanly and covered with tar or paint.

Literature.—This account of the disease has been drawn up partly from observations of the staff at Wisley, partly from the literature of the disease. The principal papers dealing with the disease published in England (where practically all the experimental work has been done) are :

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DWARF FRENCH BEANS AT WISLEY, 1919.

TWO HUNDRED AND FIFTY-THREE stocks of beans were sown in the trial of Dwarf French Beans at Wisley in 1919. Of these the following were climbers or semi-climbers and are not further referred to, viz., Nos. 154, 179, 214, 215; Nos. 232-238, 240 of Japanese origin; and Nos. 246-248. The following were seedlings or unnamed selections, and further reference to them is omitted, viz., Nos. 100, 219-231.

The trial was carried out on land which had been cropped with potatoes in 1918, and which was dug during the winter but not manured. The seeds were sown on May 16 in double rows a foot apart, two feet six inches separating the pairs of rows. The plants were eventually thinned out to one foot apart.

The ground was very dry at sowing time, and germination was therefore rather irregular, and this interfered to some extent with the weight of crop produced as shown below; the weights given indicate, however, which varieties may be regarded as heavy and which as light croppers. These weights show the quantity picked from half a double row, viz., eighteen feet, the remaining half being left to ripen. In a few cases germination was poor, and this is indicated in the description, and the fact must be taken into consideration in comparing the yields.

The relative earliness of the different stocks is indicated by the dates at which they are each said to be "ready." Another very important point is the length of season during which the plants remain in bearing. In private gardens, and especially in small gardens and allotments, a long season is of great importance, and some of the varieties in the trial had pods fit to pick from July 22-24 until they were cut down by frost in mid-September—Nos. 41, 43, 44, 125 were particularly noticeable in this respect; while Nos. 103-107, and 243 were, though later in starting, of value over a long season. On the other hand, some matured their whole crop at about the same time, so that the pods might be picked and the plants immediately cleared away to make room for another crop—No. 145, "Fifty Days," was most marked in this respect, but some others showed this quality which will appeal particularly to the market gardener.

The Fruit and Vegetable Committee visited the trials on two occasions, viz., August 7 and August 21. The dates on which the award was given in each case will be a further indication of earliness or lateness of maturing.

The following were selected for Awards:

WAX-POD VARIETIES.

Award of Merit.

186. Improved White Wax, sent by Messrs. Carter. [F.C.C. 1872 (Osborne).]

TOUGH-PODDED GREEN VARIETIES.

Award of Merit.

- 13, 14. Sunrise, sent by Messrs. Carter and Barr.* [A.M. 1914 (Carter).]
- { 22. Masterpiece Improved, sent by Messrs. A. Dickson.
23. Masterpiece Selected, sent by Messrs. Dickson and Robinson.
24, 25, 26, 27. Masterpiece, sent by Messrs. Simpson, Sydenham, Sutton, Watkins and Simpson. [H.C. 1914 (Sutton).]
- { 45. Longsword Re-selected, sent by Messrs. Carter.
46, 47. Reliance, sent by Messrs. Sutton and Barr.* [A.M. 1903 (Sutton).]
48. Fillbasket, sent by Messrs. Barr. [C. 1914 (Barr).]
- { 41. Bounteous, sent by Messrs. Watkins & Simpson.
43, 44. Perpetual, sent by Messrs. Barr* and Carter. [F.C.C. 1914 (Carter).]
125. Evergreen sent by Messrs. Sutton. [A.M. 1909 (Sutton).]
66. The Shah, sent by Messrs. Barr.*
- { 68, 69, 252. Superlative, sent by Messrs. Sutton, Barr,* and Nutting.
70, 71. Magpie, sent by Messrs. Carter and Barr. [A.M. 1914 (Carter).]
- { 75. Métis, sent by R.H.S.
76. Black Prince, sent by Messrs. Barr.*
- { 73. Prodigious, sent by Messrs. Carter.
74. Feltham Prolific, sent by Messrs. Watkins & Simpson.
- { 88. White Haricot, sent by Messrs. Sutton.
89. White Leviathan, sent by Messrs. Watkins & Simpson.
- { 96. Dunkin's Dwarf, sent by Mr. Dupkin.
- 143, 251. Earliest of All, sent by Messrs. Watkins & Simpson, and Nutting.
145. Fifty Days, sent by Messrs. Carter.
149. Early Mohawk, sent by Messrs. Morse.
175. Satisfaction, sent by Messrs. Sutton.
176. Early Wonder, sent by Messrs. Carter.

Highly Commended.

35. Bountiful, sent by Messrs. Webb.
36. The Sorsby, sent by Messrs. Dickson, Brown and Tait.
37. Haricot nain Gloire de St. André, sent by Messrs. Cooper-Taber.
38. Guernsey Wizard sent by Mr. Warry.
39. Nain de Perreux, sent by R.H.S.
40. Excelsior, sent by Messrs. Barr. [A.M. 1914 (Barr).]
50. Prolific Negro, sent by Messrs. Sutton. [H.C. 1914 (Sutton).]
54. Black Hermitage, sent by Messrs. Barr.*
151. Suisse Gris, sent by R.H.S.

* These senders have not yet included this variety in their catalogues.

- 158. Canadian Wonder selected, sent by Messrs. Sutton.
 - 159. Canadian Wonder, sent by Messrs. Carter.
 - 161. Canadian Wonder selected strain, sent by Messrs. Dobbie.
- [F.C.C. 1914 (Hurst, Sutton, Barr, Carter, Sydenham).]

In former trials, Awards had been given to the following varieties which were represented in the trial, in addition to those indicated above, but in the present trial the Committee regarded them as of less value than those already mentioned.

Old Awards.

203. Dwarf Butter [F.C.C. 1873 (Carter)]; 103, 104, 105, 106, 107, 243. Ever-bearing [A.M. 1899 (Dean, Hurst, and Dickson)]; 199. Mont d'Or [F.C.C. 1873 (Carter)]; 10, 11, 12. Ne Plus Ultra [A.M. 1897 (J. Veitch, Hurst, Cooling, Dean, Dickson, Watkins & Simpson)]; 15, 16, 17. Osborn's Forcing [F.C.C. 1873 (Osborn)]; 135, 136, 137. Perfection [A.M. 1899 (Dean)]; 157. Progress [A.M. 1899 (J. Veitch)]; 52, 53. Negro Early Fortyfold [F.C.C. 1914 (Watkins & Simpson)]; 80, 81. White Model [C. 1914 (Carter)]; 109, 110. Roi des Verts [A.M. 1895 (Vilmorin)]; 141, 142. Early Favourite [A.M. 1914 (Sutton)]; 195. Eldorado [A.M. 1914 (Simpson)]; 79. Haricot nain à Mangetout extra hâtif [A.M. 1895 (Vilmorin)]; 118, 119, 120, 121. Stringless Greenpod [A.M. 1899 (Watkins & Simpson)].

The awards made have reference solely to the value of the plant as a producer of green "snap pods"; not to value as dry haricots for winter use, for which the Dutch Brown bean which the Society introduced in 1917 is so useful; nor for the production of "flageolets," the fully formed but unripe beans shelled out of the pods when too old for use as "snaps." Nor are the awards given with any idea of indicating which varieties are most suitable for growing in pots under glass. This is a matter for a separate trial to be carried out in spring 1920.

The references made to the different culinary uses of beans in the report of the trial of Climbing Beans [JOURNAL R.H.S. xlv. p. 101 (1919)] apply equally here, as do the remarks upon the extraordinary variation to be seen within the bounds of the one species, *Phaseolus vulgaris*, to which all the varieties here reported upon belong with the exception of No. 176 which is said to be a hybrid between this and the Scarlet Runner.

Several of the American and Continental forms were represented in the trial as well as practically all those generally grown in England, but from their rather ugly shape several of the excellent beans with very fleshy pods, favourites in America, have not yet gained a strong hold in English gardens, and comparatively few, as yet, grow the wax-pod beans. Colour of pod, indeed, as well as shapeliness counts for much in the market; the darker green pods, straight and smooth, with their width carried well up to the neck, finding the greatest favour. On the whole possibly it may be said that the flatter-podded types are heavier croppers than the round-podded, but this is not invariably the case, as for instance in Nos. 116, 117. Attention of raisers of new varieties might well be drawn to the proneness some varieties have to droop their pods so that they rest upon the ground. This is a drawback, as they become covered with grit for at least part

of their length, and, further, if the seed is being saved for use as "haricots" in winter, many seeds become greatly discoloured and have to be discarded. Attention was paid to this point in making awards.

We take this opportunity of acknowledging with grateful thanks the valuable advice and assistance rendered to us by Messrs. Dicks, Giles, and Simpson, at all stages of the trial.

VARIETIES.*

- | | | |
|-------------------------------------|---------------------------------------|---------|
| 1. †South African Dutch, C. a. | 52. Negro Early Fortyfold | } C. g. |
| 2. McMichie's Brown Dutch, C. a. | 53. " " " | |
| 3. Ryder's Dutch Type, C. a. | 54. Black Hermitage, C. g. | |
| 4. Dutch Brown | 55. H. nain Merveille du Marché, | |
| 5. " " | A. b. i. | |
| 6. Brown Dutch | 56. Longpodded Negro, C. g. | |
| 7. " " | 57. Early Black Wonder, C. g. | |
| 8. Dutch Brown R.H.S. Stock, C. a. | 58. Franconville, C. g. | |
| 9. Dutch Brown, C. a. | 59. Negro Longpod, C. g. | |
| 10. Ne Plus Ultra | 60. Monster Negro, C. g. | |
| 11. " " " | 61. Woking Wonder, A. b. i. | |
| 12. " " " | 62. Negro Longpod, C. g. | |
| 13. Sunrise | 63. Early Belgian Negro, C. g. | |
| 14. " " | 64. Black Valentine | } C. g. |
| 15. Osborn's Forcing | 65. " " | |
| 16. " " | 66. The Shah, C. g. i. | |
| 17. " " | 67. H. nain Merveille de Paris, C. j. | |
| 18. Sutton's Forcing, C. a. | 68. Superlative | } C. h. |
| 19. Cent pour un, C. a. | 69. " " | |
| 20. Jaune cent pour un, C. a. | 70. Magpie | } C. h. |
| 21. Hundredfold, C. a. | 71. " " | |
| 22. Masterpiece, Improved, C. d. i. | 72. Perfection, A. m. | |
| 23. Masterpiece, Selected, C. d. i. | 73. Prodigious, C. i. | |
| 24. Masterpiece | 74. Feltham Prolific, C. i. | |
| 25. " " | 75. Métis, C. h. | |
| 26. " " | 76. Black Prince, C. h. | |
| 27. " " | 77. Extra Early White Forcing, C. h. | |
| 28. Long Yellow Six Weeks, C. d. 2. | 78. Etampes Early White, C. h. | |
| 29. Plentiful, C. d. 2. | 79. H. nain à Mangetout extra | |
| 30. Holborn Wonder | hâtif, B. a. | |
| 31. " " | 80. White Model | } C. h. |
| 32. Early Bountiful, C. d. 2. | 81. " " | |
| 33. Bountiful | 82. Longpodded White, C. h. | |
| 34. " " | 83. Long White Canterbury | } C. h. |
| 35. Bountiful, C. d. i. | 84. " " | |
| 36. The Sorsby, C. d. i. | 85. Hurst's Canterbury, C. h. | |
| 37. Gloire de Saint André, C. d. i. | 86. Improved White Canterbury, | |
| 38. Guernsey Wizard, C. d. i. | C. h. | |
| 39. Nain de Perreux, C. d. i. | 87. Nettle-leaved Canterbury, C. h. | |
| 40. Excelsior, C. d. i. | 88. White Haricot, C. h. | |
| 41. Bounteous, C. e. | 89. White Leviathan, C. h. | |
| 42. Wonderful, C. d. i. | 90. White Queen. | |
| 43. Perpetual | 91. White Dutch or Case Knife, C. h. | |
| 44. " " | 92. Dwarf Case Knife, C. h. | |
| 45. Re-selected Longsword, C. d. i. | 93. Emperor William, C. h. | |
| 46. Reliance | 94. H. de Soissons nain, C. h. | |
| 47. " " | 95. King of the White, C. h. | |
| 48. Fillbasket, C. d. i. | 96. Dunkin's Dwarf, C. h. | |
| 49. Hurst's Pale Dun, C. d. 2. | 97. Wonderful White Haricot, C. h. | |
| 50. Prolific Negro, C. g. | 98. Flageolet blanc à longue cosse, | |
| 51. Little Prince, C. g. | C. h. | |

* See footnote p. 120.

† The letters etc. following the name refer to the descriptions given below.

99. Ford-hook Favourite, B. a.
 100. Selection from Dutch Case Knife.
 101. Comtesse de Chambord, C. k.
 102. Dwarf Princess, B. a.
 103. H. l'Inépuisable, C. k.
 104. Everbearing or Inexhaustible, C. k.
 105. Everbearing, C. k.
 106. Sutton's Everbearing C. k.
 107. Everbearing, C. k.
 108. Chevrier Vert, C. l.
 109. Roi des Verts, C. l.
 110. King of the Greens, C. l.
 111. Green Haricot, C. l.
 112. Ryder's Dwarf Green, C. l.
 113. Green Gem } C. l.
 114. " " }
 115. Wonder of France, C. l.
 116. Dwarf Lyonnaise, B. d.
 117. Nain Lyonnaise à très longue cosse, B. d.
 118. Stringless Greenpod }
 119. " " } B. c.
 120. " " }
 121. " " }
 122. Canadian Glory } B.
 123. " " }
 124. Evergreen } C. c.
 125. " " }
 126. Incomparable, C. b.
 127. Surpasse Empereur, C. f.
 128. Sion House, C. o.
 129. Early Gem, C. o.
 130. Early Warwick, C. p. 1.
 131. Best of All, C. o.
 132. Early Parisian, C. o.
 133. Haricot nain de Paris, C.
 134. Harbinger, C. p. 2.
 135. Perfection }
 136. " } C. p. 2.
 137. " }
 138. Gris Maraîcher, C. p. 2.
 139. Extra Early Valentine, B. f.
 140. Extra Early Red Valentine, B. f.
 141. Early Favourite } C. q. 1.
 142. " " }
 143. Earliest of All, C. q. 1.
 144. Early Prolific, C. q. 1.
 145. Fifty Days, C. r.
 146. Cluster, C. q. 1.
 147. Brunning's Perfect, C. q. 2.
 148. Early Mohawk } C. q. 1.
 149. " " }
 150. Early Wonder, C. t.
 151. Suisse Gris, C. s.
 152. Langport Wonder, C. t.
 153. Extra Early Refugee, B. g.
 154. Ex-early Refugee.
 155. Abundance, C. s.
 156. Gloire de Lyon, C. s.
 157. Progress, C. s.
 158. Canadian Wonder Selected, C. m.
 159. Canadian Wonder, C. m.
 160. Selected Canadian Wonder, C. m.
 161. Canadian Wonder }
 162. " " } C. m.
 163. " " }
 164. " " }
 165. " " }
 166. Canadian Express, C. m.
 167. Canadian Wonder }
 168. " " } C. m.
 169. " " }
 170. Flageolet Rouge nain, C. m.
 171. Magnum Bonum } C. n.
 172. " " }
 173. Goliath, C. n.
 174. Improved White Advancer, C. n.
 175. Satisfaction, C. u.
 176. Early Wonder, C. v.
 177. Prince Edward, C. o.
 178. Victoria, C. o.
 179. Italian Haricot.
 180. Early Gem, A. a. 2.
 181. King of the Wax
 182. Roi des Beurres } A. a. 1.
 183. " " }
 184. King of Wax-pods No. 1 }
 185. King of Wax-pods No. 2 }
 186. Improved White Wax, A. a. 1.
 187. White Wax Bush, A. a. 1.
 188. White Algerian, A. a. 1.
 189. Jaune de Chine, B. b.
 190. Prolific Black Wax, A. b. 1.
 191. Improved Prolific Black Wax A. b. 1.
 192. Pencil-pod Black Wax A. b. 2.
 193. Currie's Rust-proof Black Wax, A. b. 1.
 194. Marché Butter, A. b. 1.
 195. Eldorado, A. b. 1.
 196. Saddleback Wax } A. b. 1.
 197. " " }
 198. Golden Wax-pod, A. b. 1.
 199. Mont d'Or, A. b. 1.
 200. Wood's Centenary } A. h.
 201. " " }
 202. Golden Wax, A. g.
 203. Dwarf Butter, A. g.
 204. Rust-proof Golden Stringless, A. g.
 205. Improved Golden Wax, A. g.
 206. Wardell's Kidney Wax } A. f.
 207. " " }
 208. Golden-eyed Wax, A. c.
 209. Brittle Wax, A. d.
 210. New Early Brittle Wax, A. d.
 211. Express Dwarf Butter, A. i.
 212. New Kidney Wax, A. e.
 213. Glory Butter, A. l.
 214. Hodson Wax.
 215. " " " "
 216. Stringless Refugee, A. k.
 217. Phoenix Wax-pod, A. j.
 218. Golden Queen, A. j.
 219. No. 1.
 220. No. 2.
 221. No. 3.
 222. No. 4.
 223. No. 5.
 224. No. 6.
 225. No. 7.
 226. No. 8.
 227. No. 9.
 228. No. 10.
 229. Out of Dutch Brown.
 230. " " " "
 231. Dutch Brown.

- | | |
|--|---|
| 232. Toromame. | 243. Everbearing. |
| 233. Mavu-Udzura. | 244. Dunelm Selected, <i>B. h.</i> |
| 234. Muroran. | 245. Kintoki, <i>B. e.</i> |
| 235. Burmah. | 246. Dunelm Wonder. |
| 236. Chiu-naga-Udzura. | 247. T.U.B. |
| 237. Kotebo. | 248. L.B. Selected. |
| 238. Chiutuku. | 249. Sir Joseph Paxton, <i>C. a.</i> |
| 239. Kintoki, <i>B. e.</i> | 250. Canadian Wonder, <i>C. m.</i> |
| 240. Otebo. | 251. Earliest of All, <i>C. q. 1.</i> |
| 241. Kumamoto, <i>C. k.</i> | 252. Superlative, <i>C.</i> |
| 242. Japanese Wood's Centenary, <i>A. h.</i> | 253. Emperor of Russia, <i>C. p. 2.</i> |

NOTES AND DESCRIPTIONS.

In the following notes an endeavour has been made to group together the varieties which have characters in common, in order to indicate where likenesses are great, but it must be borne in mind that two beans may be identical in their pod characters, and different in their seeds, or similar in their seeds to all appearance, but different in everything else. Where no space separates descriptions, there the resemblance may be taken as closest. Where there is a space separating them the resemblance is less evident.

A. WAX-POD BEANS.

The wax-pod or butter beans are characterized by the yellow colour of the pods, usually evident from the first, but in some cases developing only as age progresses. They are not to be confused with the butter beans of the grocers' shops which are varieties of the Lima bean, and not reliable for outdoor cultivation in England.

a. Seeds white; flowers white.

1. Young pods flattish.

- | | |
|---|--------------|
| 181. KING OF THE WAX (Carter) | }—Forms with |
| 183. ROI DES BEURRES (R.H.S.) | |
| 184, 185. Selections out of King of the Wax-pods (R.H.S.) | |
- roundish white seeds, and short broad pods. All stocks require further selection. No. 183 was the most regular.

182. ROI DES BEURRES (Barr*).—Seeds long oval and larger; pods longer, up to 6 inches, but stock not true.

186. IMPROVED WHITE WAX (Carter), *A.M.*, Aug. 7, 1919.—Plant vigorous, rather spreading, 18 inches; dark, becoming yellowish green; pods in large clusters well above soil; 7 inches long, straight, almost smooth, light yellow, $\frac{1}{4}$ in. wide; fleshy, with little parchment or string; seeds up to 6, oval, rather small, rounded at end. Ready July 24. Crop green, 10 $\frac{1}{2}$ lb.† Raised and introduced by sender.

187. WHITE WAX BUSH (Burpee).—Plant erect, 18 inches, dark, becoming yellowish green; pods in large compact clusters, tending to rest on soil, 3 $\frac{1}{2}$ inches, smooth, yellow, $\frac{1}{2}$ inch broad; fleshy, with little parchment and stringless; seeds up to 4, medium thick oval. Ready Aug. 5. Crop green, 9 lb.

188. WHITE ALGERIAN (R.H.S.).—Stock requires selection.

2. Young pods round:

180. EARLY GEM (R.H.S.).—Plant small, 12 to 15 inches, erect; foliage medium, dark green variegated yellowish; pods in small clusters, 4 inches long, curved, smooth, becoming yellow, round, crease-backed, $\frac{3}{8}$ to $\frac{1}{2}$ inch diameter; very

* This sender does not yet list this variety.

† The weights given are from a double row 18 feet long (see p. 316).

fleshy, without parchment or string, more or less constricted between seeds seeds up to 5, short oval. Ready July 24. Crop green, 9 lb.

b. Seeds black ; flowers lilac.

1. Pods, at least at first, flattish oval.

190. PROLIFIC BLACK WAX (Morse)

191. IMPROVED PROLIFIC BLACK WAX (Thorburn) } Plant of medium size,

erect, 15 inches ; foliage medium size, dark green ; pods in large loose clusters, well above soil, 4 inches long, curved, smooth, light yellow becoming very slightly streaked purple, $\frac{1}{2}$ inch broad ; fleshy, without string or parchment ; seeds 5, small, oval, rounded or truncate at ends. Ready July 22. Crop 6 $\frac{1}{2}$ lb.

* * *

196, 197. SADDLEBACK WAX (Barr,* Burpee).—Similar in habit, etc., to Nos. 190, 191, but pods without purple markings and perhaps a little later.

* * *

193. CURRIE'S RUST-PROOF BLACK WAX (Thorburn).—A mixed stock containing climbers and both green and pale yellow pods. Pods stringy and containing parchment.

* * *

55. HARICOT NAIN MERVEILLE DU MARCHÉ (Vilmorin)

194. MARCHÉ BUTTER (Barr*)

195. ELDORADO (Simpson)

} These three stocks were nearly related, but not quite true either in shape of pods or colour. No. 195 was the best stock. No. 194 had shorter, rounder, tougher pods, but Nos. 55 and 195 were stringless and without parchment.

* * *

199. MONT D'OR DWARF (Barr).—Plant of medium size, 15 inches ; deep green ; pods in small loose clusters, 4 to 4 $\frac{1}{2}$ inches long, almost straight, smooth pale yellow, about $\frac{1}{2}$ inch diameter, thick oval in section ; very fleshy, stringless, and without fibre ; seeds medium size, full oval, rounded at end, reddish-black to black. Ready Aug. 5. Crop green, 8 $\frac{1}{2}$ lb.

* * *

198. GOLDEN WAX-POD (Sutton).—A mixed stock.

* * *

61. WORKING WONDER (Nunn).—A cross between Canadian Wonder and Dwarf Golden Butter. Pods constricted between beans, yellow with purplish tinge, flesh thick, seeds large. Ready July 24. Crop green, 8 $\frac{1}{2}$ lb. Requires further selection.

2. Pods rounder when young.

192. PENCIL-POD BLACK WAX (Thorburn).—Of medium size, 15 inches high, dark green ; pods in large loose clusters, much curved, almost sickle-shaped, about 7 inches long, smooth, light yellow, about $\frac{1}{2}$ inch broad, less in depth, crease-backed ; very fleshy, quite stringless and without parchment ; seeds 5, small, cylindrical, truncate. Ready July 29. Crop green, 7 lb.

c. Seeds white with golden blotch round eye ; flowers white.

208. GOLDEN-EYED WAX (Thorburn).—Plant of medium size, 16 inches ; foliage large, of medium green ; pods in medium clusters, 4 to 4 $\frac{1}{2}$ inches ; slightly curved, smooth, deep yellow, flat oval, $\frac{3}{8}$ inch wide ; fleshy, but stringy and tough ; seeds 5, medium oval, round or truncate at ends. Ready August 1. Crop green, 6 lb. Stock not quite true.

d. Seeds white with black markings round eye ; flowers white.

209. BRITTLE WAX (Barr*)

210. NEW EARLY BRITTLE WAX (Burpee)

} Plant of medium size, erect, 16 inches ; foliage medium green ; pods in medium clusters, 6 to 6 $\frac{1}{2}$ inches, more or less curved, round in section, crease-backed, $\frac{3}{8}$ inch diameter ; very fleshy, stringless and without fibre ; seeds 6, medium size, long, truncate. Ready August 4. Crop green, 6 lb.

* This sender does not yet list this variety.

e. Seeds white with slight reddish markings round eye.

212. NEW KIDNEY WAX (Burpee).—Stock not quite true. Pods $5\frac{1}{2}$ to 6 inches, almost straight, round. Seeds round or truncate at end.

f. Seeds white with mottled brown markings on side round margin and occasional spots; flowers white.

206, 207. WARDELL'S KIDNEY WAX (Thorburn, Barr*).—Plant medium, 16 inches; foliage dark green; pods $4\frac{1}{2}$ inches long, generally straight, flat oval, $\frac{1}{2}$ inch diameter, yellow; very fleshy, stringless, little parchment; seeds 4, large, flat oval, ends rounded. Ready July 29. Crop green, 6 lb.

g. Seeds white with purplish markings covering about a quarter; flowers white.

202. GOLDEN WAX (Morse)

204. RUST-PROOF GOLDEN STRINGLESS (Barr*) } Plant similar to Nos. 206,
205. IMPROVED GOLDEN WAX (Thorburn)

207; pods 4 inches long, flat oval, light bright yellow, $\frac{1}{2}$ inch in diameter, showing seeds somewhat; very fleshy, stringless or almost so, and with little parchment; seeds 5, short oval, rounded at end. Ready July 22. Crop green, $6\frac{1}{2}$ lb.

203. DWARF BUTTER (Carter).—Description as above. Stock contained some plants with a tendency to climb.

h. Seeds white with brownish markings covering about half seed; flowers white.

200, 201. WOOD'S CENTENARY (Barr,* Watkins and Simpson).—Characters of plant and pod very similar to Nos. 202–205, but rather later (ready Aug. 1). Crop green, 7 lb.

242. From Japan (Yokohama Nursery Co.).—Characters of Nos. 200, 201.

i. Seeds white with purplish markings covering about $\frac{3}{4}$ of seed; flowers white.

211. EXPRESS DWARF BUTTER (Barr).—Plant small, 12 to 14 inches; foliage corrugated, rough, dark green; pods in large compact clusters carried well above soil, 6 inches long, slightly curved, or straight, rather rough, light yellow, oval in section, $\frac{7}{16}$ inch diameter; flesh thick, with little parchment, but becoming stringy in age; seeds 6, rather small, cylindrical, rounded at end. Ready July 24. Crop green, $10\frac{1}{2}$ lb.

j. Seeds purple of Canadian Wonder type; flowers lilac.

218. GOLDEN QUEEN (Webb).—Plant large, 18 inches, erect, medium green; pods in medium clusters held well above soil, 6 to 7 inches long, yellow, flattish oval, somewhat curved, and showing seeds, $\frac{1}{2}$ inch broad; flesh thick, with little parchment, but becoming stringy with age; seeds 6, large. Ready July 28. Crop green, $11\frac{1}{2}$ lb.

217. PHŒNIX WAX-POD (Barr).—Nearly related to foregoing, but not quite true.

k. Seeds flesh-coloured with much purple; flowers dark lilac.

216. STRINGLESS REFUGEE (Thorburn).—Plant large, spreading, with a tendency to run, 18 inches high; foliage medium, rough, rather narrow; pods in small clusters, resting on soil, 4 to $4\frac{1}{2}$ inches, curved, smooth, yellow with few reddish markings, round, $\frac{3}{8}$ inch diameter, point very curved; very fleshy, stringless, with little parchment; seed 5, similar to 'Progress' (No. 157). Ready August 5. Crop green, $3\frac{3}{4}$ lb.

l. Seeds buff; flowers dark lilac.

213. GLORY BUTTER (R.H.S.).—Plant large, 18 inches, dark green; pods $5\frac{1}{2}$ inches, almost straight, smooth, yellow with reddish mottlings, roundish oval in section, $\frac{7}{16}$ inch diameter; very fleshy, little parchment, but becoming stringy with age; seeds 6, medium, rounded at end. Ready July 23. Crop green, $11\frac{1}{2}$ lb.

m. Seeds white with black markings covering half; flowers white.

72. PERFECTION (Barr*).—Plant large, erect, 18 inches; foliage yellowish green, large; pods in large clusters tending to rest on soil, 7 inches long, roundish oval in section, smooth, light yellow, straight, $\frac{5}{16}$ inch diameter; flesh thick, stringy, with but little fibre; seeds 5, small, cylindrical, rounded at ends. Ready July 24. Crop green, 10 lb.

* This sender does not yet list this variety.

B. EDIBLE GREEN-PODDED BEANS.

The varieties included here are free from tough skin or parchment until ripe, and generally free also from string in the back. They may therefore be cooked whole. The pods break quite readily when bent and retain this character until quite old. Some of the wax-pod beans already described also have this character and a few of those included among the tough-podded varieties in the next section might perhaps be included here, but in the main all those placed in that section have some amount of tough skin inside the pod and a stronger string in their early stages.

a. Seeds white ; flowers white.

99. FORD-HOOK FAVOURITE (Burpee).—Plant vigorous, 18 inches ; foliage dark green ; pods in loose clusters well above soil, straight or slightly curved, $4\frac{1}{2}$ to 5 inches long, smooth, light green, $\frac{3}{8}$ inch diameter, round in section ; very fleshy, stringless, and without parchment ; seeds 6, medium size, roundish oval. Ready August 5. Crop green, $10\frac{1}{4}$ lb.

79. MANGETOUT EXTRA HÂTIF (Vilmorin).—Plant of medium size, 12 to 15 inches ; foliage medium, yellowish green ; pods $4\frac{1}{2}$ to 5 inches, more or less curved, medium green, round in section, $\frac{7}{16}$ inch diameter ; very fleshy, stringless, and without parchment ; seeds 6, medium size, creamy white, oblong. Ready July 29. Crop green, $6\frac{1}{2}$ lb.

102. DWARF PRINCESS (R.H.S.).—Pods of type of climbing 'Princess,' and plants showing a tendency to climb and be borne down by crop. Seeds small. Crop green, $11\frac{1}{2}$ lb.

b. Seeds bright yellow ; flowers white.

189. JAUNE DE CHINE (Barr *).—Of medium size, 16 inches ; foliage of medium size, dark green ; pods 4 to $4\frac{1}{2}$ inches, light green, rather rough, oval in section, $\frac{1}{2}$ inch diameter ; flesh thick, stringless, and with little parchment ; seeds 5, of medium size, roundish oval. Ready August 11. Crop poor.

c. Seeds dark brown ; flowers lilac.

122, 123. CANADIAN GLORY (Barr,* Carter).—Plant tall, 18 to 20 inches ; foliage dark green, large ; pods 5 inches in medium-sized loose clusters, fairly straight, rough, light green, round, $\frac{1}{2}$ to $\frac{3}{8}$ inch diameter ; very fleshy, stringless, and with little parchment ; seeds 5, roundish oval, medium size. Ready July 29. Crop green, $8\frac{1}{2}$ lb.

118, 119, 120, 121. STRINGLESS GREENPOD (Thorburn, Barr,* Burpee, Morse).—Characters as foregoing.

d. Seeds brown ; flowers lilac.

116. DWARF LYONNAISE (Barr)

117. NAIN LYONNAISE À TRÈS LONGUE COSSE (R.H.S.) } Plant large, 18 to 22 inches, spreading ; foliage rough, yellowish to dark green ; pods in loose clusters carried well above soil, more or less curved, smooth, medium green, round, $\frac{3}{8}$ inch diameter ; flesh thick, inclined to be stringy but with little parchment ; seeds 5, long, oval, truncate. Ready August 2. Crop, $12\frac{1}{2}$ lb.

e. Seeds purple ; flowers lilac.

239, 245. KINTOKI (Yokohama Nursery Co., Durham).—Plant medium, 15 inches, erect ; leaves medium dark-green mottled yellow ; pods few, tending to rest on soil, 5 inches, straight, smooth, medium green, flat, then round, crease-backed, $\frac{3}{8}$ inch wide ; flesh thin, stringless, and without parchment ; seeds 4, large, thick oval. Ready July 30. Crop small.

f. Seeds mottled two shades of pink ; flowers white.

139. EXTRA EARLY VALENTINE (Thorburn)

140. EXTRA EARLY RED VALENTINE (Morse) } Plant of medium size, erect, foliage medium, dark green ; pods in medium clusters, 4 to $4\frac{1}{2}$ inches long, more or less curved, smooth, light to medium green, $\frac{3}{8}$ to $\frac{1}{2}$ inch diameter, round ; very fleshy, stringless, without parchment ; seeds up to 5, straight, flat oval, generally truncate. Ready July 29. Crop green, 7 lb.

* This sender does not yet list this variety.

g. Seeds flesh-coloured, almost covered with dark purple ; flowers dark red.

153. EXTRA-EARLY REFUGEE (Thorburn).—Plant of medium size, 15 inches, erect ; foliage medium size, rough, yellowish green ; pods $4\frac{1}{2}$ to 5 inches, curved, smooth, round, light green with purplish markings, $\frac{3}{8}$ inch diameter ; very fleshy, stringless at first, but becoming stringy ; seeds 5, large, abruptly rounded at ends. Ready July 30. Crop green, $6\frac{1}{2}$ lb. (but germination poor).

h. Seeds pale dun ; flowers lilac.

244. DUNELM SELECTED (Durham).—A vigorous erect plant, 18 inches ; foliage large, rather shining dark yellowish green ; pods in large compact clusters, more or less resting on soil, 5 inches long straight or curved and twisted, rather rough, medium bright green, round, crease-backed, $\frac{1}{2}$ inch in diameter ; very fleshy, with little parchment, but inclined to be stringy ; seeds 4, rather difficult to shell, of medium size, thick oval. Crop green good.

C. TOUGH GREEN-PODDED BEANS.

This section includes most of the forms commonly grown in England in the open air. The pods, when they are ready for use, contain a certain amount of tough membrane forming an inner skin, but this rapidly increases in toughness as the pods age, the "string" also develops to a considerable extent and the pods cannot therefore be cooked as picked. They are generally, however, very tender when prepared in the usual manner. The distinctions are largely based upon depth of green of pods and straightness of pod. The deeper green forms meet the readiest sale, as they remain fresh looking longer than the forms which are normally of a more yellow tinge.

a. Seeds brown ; flowers lilac.

DUTCH BROWN TYPE.—This bean was introduced by the R.H.S. in 1917 for use as a haricot and has become well known and widely grown. The pods may be eaten green but are less suited for that purpose than are those of several other varieties. It is, however, an excellent cropper and the dried beans are of first-class flavour. Two forms, one inferior to the other in size of pod and seed and cropping as well as in habit, are grown in Holland, and both have now found their way into England and were represented in the trial. The true and superior type of Dutch Brown Bean is represented by the R.H.S. stock (No. 8) and also by Nos. 6 and 7.

6. 7. 8. DUTCH BROWN (R. Veitch, Barr, R.H.S.).—A vigorous variety 18 inches high, dark green ; pods numerous, 5 to $5\frac{1}{2}$ inches long, almost straight, roundish, about $\frac{1}{2}$ inch diameter, fairly smooth, light green ; somewhat bulged over beans, stringy, and soon tough ; flesh of medium thickness ; seeds 4 or 5 in a pod, of medium size, roundish oval, generally rounded at end. Crop green, $9\frac{1}{2}$ lb. Ripens well, easy to shell.

1. AFRICAN BROWN (Wallace)

2. SOUTH AFRICAN BROWN (McMichie)

3. BROWN HARICOT (Dutch type) (Ryder)

4. DWARF DUTCH BROWN (Wallace)

5. DUTCH BROWN (Carter)

rarely $4\frac{1}{2}$ inches long by $\frac{1}{2}$ inch wide, scarcely bulging over seeds ; flesh rather thinner ; seeds up to 5, small, round in section, often truncate at end. Crop green, 7 lb. Ripens well, shells easily. An inferior form to Nos. 6, 7, 8.

* * *

10. NE PLUS ULTRA, SELECTED STRAIN (Sutton).—Plant vigorous, 18 inches, dark green ; pods numerous, up to 6 inches, somewhat curved near point ; flattish, $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, rather rough, medium dull green ; flesh thick, becoming stringy when aged, parchment medium ; seeds up to 5, but rather apt to "miss" ; of same colour as, but rather longer than, No. 8. Ready July 28. Crop green, $8\frac{1}{2}$ lb. Dry seed threshes out easily. Distinct from 9, 11, 12, below. Introduced by Messrs. Sutton.

249. SIR JOSEPH PAXTON (R.H.S.).—Characters similar to No. 10. Ready July 29. Crop green, $8\frac{1}{2}$ lb.

* * *

11, 12. NE PLUS ULTRA (Watkins & Simpson, Cooling).—Plant vigorous, 16 inches, dark green ; pods numerous, up to 6 inches, rather curved, fairly round,

nearly $\frac{1}{2}$ inch diameter, rather rough, light bright green; flesh rather thin, with little parchment, but soon becoming stringy; seeds up to 5; ripe seed similar in colour to (or darker than) No. 8, but smaller and narrower; generally rounded. Ready July 23. Crop green, 9 lb. Dry seed easy to thresh. Raised by Messrs. Cooling of Bath. Earlier than No. 10. [No. 9 was sent to us in 1918 as 'Dutch Brown,' but proved to be a mixed stock of 'Ne Plus Ultra.']

* * *

13, 14. SUNRISE (Carter, Barr *), A.M. August 7, 1919.—Of Ne Plus Ultra type, 18 inches, but foliage larger and deeper green; pods straight, up to 7 inches long; flesh thicker; seeds smaller and with brown instead of black ring at hilum. Ready July 23. Crop green, 10 $\frac{1}{2}$ lb. Raised and introduced by Messrs. Carter. (Ne Plus Ultra $\times$ Perpetual.)

* * *

18. FORCING (Sutton).—Plant of medium size, 12 to 15 inches, dark green; pods numerous, up to 5 inches, rather curved, rather thin at neck, flat, $\frac{1}{2}$ inch diameter, fairly smooth, medium green; flesh rather thin, becoming tough, but with little parchment or string, at first; seeds up to 4, small and when ripe with a faintly purple tinge, kidney, usually round at end. Ready July 24. Crop green, 10 lb. Introduced by sender.

* * *

19, 20, 21. HUNDRED-FOLD (CENT POUR UN) would come in here, but the stocks grown presented considerable differences and require further study.

b. Seeds deep brown; flowers lilac.

126. INCOMPARABLE (Barr *).—Plant large, erect, 18 to 20 inches; foliage dark yellowish green, rough; pods in large compact clusters, well above soil, 6 $\frac{1}{2}$ to 7 inches long, slightly curved, rough, light green, flat round, $\frac{3}{4}$ inch diameter; flesh medium thickness, with little fibre, but stringy; seeds 4 large, flat kidney-shaped, rounded or truncate at ends. Ready July 24. Crop green, 7 lb.

c. Seeds marbled two shades of brown; flowers lilac.

15, 16, 17. OSBORN'S FORCING [Stevenson (two stocks), Watkins & Simpson].—Plant fairly large, 16 inches, dark green; pods fairly numerous in clusters, 5 $\frac{1}{2}$ inches, nearly straight, flat, $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter, smooth, medium green; flesh thick, little parchment or string when young; seeds 3 to 6, of medium size, round in section, round at ends. Ready July 24. Crop green, 8-9 lb.

d. Seeds pale dun; flowers lilac.

The beans with long dun-coloured seeds are fairly readily divisible when growing into two groups, the one characterized by 'Masterpiece' having darker, the other characterized by 'Long Yellow Sixweeks' with paler foliage. There are, however, small differences between the stocks within these groups, as pointed out below, the result, no doubt, of selection at different raisers' hands.

1. Foliage darker.

24, 25, 26, 27. MASTERPIECE (Simpson, Sydenham, Sutton, Watkins & Simpson)

22. MASTERPIECE IMPROVED (Dickson)

23. MASTERPIECE SELECTED (Dickson & Robinson)

} A.M.,
Aug. 7, 1919.

Plant vigorous, 18 inches, dark green; pods in large clusters; 7 $\frac{1}{2}$ inches straight, flat-round, $\frac{1}{2}$ inch diameter; little neck, rough, light green; flesh thick, stringless, and with little parchment when young, tough when old; seeds 3 to 5, large, roundish in section, almost straight or kidney. Pods rest on ground. Ready July 23. Crop green, 12 lb. Introduced by Messrs. Sutton.

45. LONGSWORD RE-SELECTED (Carter), A.M. Aug. 7, 1919.—Characters as in 'Masterpiece,' pods up to 8 inches, carrying their width well to neck. Ready July 24. Crop green, 10 lb. Grown by sender from seed received from Jersey 1913.

46, 47. RELIANCE (Sutton, Barr *), A.M. Aug. 7, 1919.—Like 'Masterpiece,' but pods perhaps rather more curved than No. 45. Ready July 24. Crop green, 10 $\frac{1}{2}$ lb. Introduced by Messrs. Sutton.

48. FILLBASKET (Barr), A.M. Aug. 7, 1919. Characters as in 'Masterpiece.' Ready July 22. Crop green, 11 lb.

* This sender does not yet list this variety.

35. BOUNTIFUL (Webb), H.C. Aug. 7, 1919.—Very similar to 'Masterpiece,' but pods shorter and with more neck, about 6 to 6½ inches. Ready July 25. Crop green, 11½ lb.

36. THE SORSBY (Dickson, Brown & Tait), H.C. Aug. 7, 1919.—Characters as in the main of 'Masterpiece,' but pods 7 inches, slightly narrower, and foliage narrower. Crop ready July 24, green, 9½ lb. Raised by Mr. Sorsby of Bramley Hall Gardens, 1910. Introduced by sender.

37. HARICOT NAIN GLOIRE DE ST. ANDRÉ (Cooper-Taber), H.C. Aug. 7, 1919.—Characters of 'Masterpiece,' but somewhat different in shade of green, and pods less regularly straight. Ready July 24. Crop green, 9 lb.

38. GUERNSEY WIZARD (Warry), H.C. Aug. 7, 1919.—Characters as 'Masterpiece,' but pods up to 8 inches, and perhaps a little greener than No. 37. Crop ready July 25, green, 14½ lb. Pods rest too much on ground. Introduced by sender.

39. NAIN DE PERREUX (R.H.S.), H.C. Aug. 7, 1919.—Characters as in 'Masterpiece,' but pods more curved and somewhat rounder, 7½ inches long. Ready July 24. Crop green, 12 lb.

40. EXCELSIOR (Barr).—H.C. Aug. 7, 1919. Very near No. 38. Crop ready July 24, green 13½ lb. Introduced by Messrs. Barr.

42. WONDERFUL (Barr *).—Plant and seed as in 'Masterpiece'; pods in large clusters, 6½ inches long, generally straight, light dull green, smooth, ¾ inch wide, roundish. Ready July 28. Crop green, 12½ lb. Introduced by Daniels Bros.

2. Foliage lighter.

28. LONG YELLOW SIXWEEKS (Thorburn).—Plants vigorous, 18 inches, yellowish green; pods in medium clusters, carried well above soil, 5 to 6 inches long, smooth, broad oval in section, curved, about ¾ inch broad, light green; flesh thick, rather stringy when old, slightly constricted between seeds (but many pods were seedless), containing up to 6 (generally 5) beans; dry seeds of medium size, pale dun with darker ring round hilum, oval in section, ends rounded or often truncate. Ready July 23. Crop green, 11½ lb.

29. PLENTIFUL (Sutton).—Characters as in No. 28, but pods somewhat darker, longer, and somewhat straight, rather narrow at neck, ½ inch diameter. Seeds with darker ring round hilum. Ready July 23. Crop green, 7 lb. Introduced by sender.

30, 31. HOLBORN WONDER (Barr,* Carter).—Characters as in No. 29. Ready July 23. Crop green, 8½ lb. Introduced by Messrs. Carter.

32. EARLY BOUNTIFUL (Barr *).—Characters as in preceding.

33, 34. BOUNTIFUL (Morse, Thorburn).—Characters as in No. 29. Ready July 23. Crop green, 10 lb.

49. PALE DUN (Hurst).—Plant as in foregoing; pods as in No. 29, but scarcely ½ inch in diameter. Crop green, 8 lb.

e. Seeds buff; flowers lilac.

41. BOUNTEOUS (Watkins & Simpson), A.M. Aug. 7, 1919.—Plant vigorous, 16 inches, fairly erect; foliage dark green, of medium size; pods in large clusters well above soil, produced continuously through a long season, 5 to 5½ inches long, straight or little curved, rough, light green, rather narrowed to neck, roundish, ¾ inch diameter, rather constricted between seeds; flesh thick, with considerable amount of parchment and string; seeds 2 to 4, small flat-round in section, usually truncate at ends, hilum with brown ring. Ready July 26. Crop green, 10½ lb. Introduced by Messrs. Watkins & Simpson.

43, 44. PERPETUAL (Barr,* Carter), A.M. Aug. 7, 1919.—Characters as in foregoing. Ready July 24. Crop green, 8½ lb.

125. EVERGREEN (Sutton), A.M. Aug. 7, 1919.—Characters as in foregoing. Ready July 29. Crop green, 8 lb.

124. Was sent in under same name but was quite distinct.

f. Seeds pinkish buff; flowers white.

127. SURPASSE EMPEREUR (R.H.S.).—Plant as above, foliage very dark; pods in medium clusters carried well above soil; 6 inches long, smooth, medium green, slightly curved, flattish oval to round, ½ inch wide; fleshy, with little parchment, and stringless at first, but becoming stringy; seeds 5, small, cylindrical, truncate. Ready July 29. Crop green, 7½ lb.

* This sender does not yet list this variety.

g. Seeds black ; flowers dark mauve.

50. PROLIFIC NEGRO (Sutton), H.C. Aug. 22, 1919.—Plant vigorous, 18 inches, dark green ; pods in large clusters, 5 to 5½ inches, carried well above soil, nearly straight, smooth, medium green, more or less marked with purple, ⅔ inch diameter ; oval in section ; flesh thick, with little parchment, but much string ; constricted between seeds ; seeds up to 5, when ripe small, black, round in section, ends usually truncate. Ready July 24. Crop green, 9 lb. Introduced by sender.

56. Sent as LONG-PODDED NEGRO belonged to this strain.

52, 53. NEGRO EARLY FORTY-FOLD (Watkins & Simpson, Barr).—Characters etc. as in No. 50. Introduced by Messrs. Watkins & Simpson.

* * *

51. LITTLE PRINCE (Dickson & Robinson).—Foliage rather paler ; pods somewhat shorter and more curved than in Nos. 50, 52, 53, slightly bulged over seeds ; seeds rather flatter, otherwise similar. Ready July 24. Crop green, 9½ lb. Raised and introduced by senders. Quite distinct from No. 76.

54. BLACK HERMITAGE (Barr *), H.C. Aug. 22, 1919.—Plant as No. 50 ; pods in large clusters, carried some resting on soil, some well above, up to 7 inches long, gracefully curved, ⅔ to ½ inch diameter, almost round, smooth, light green ; flesh thick, with little string or parchment ; not bulged over seeds ; seeds up to 6, when ripe, small, black, straight, and rather long, almost round in section, rounded at ends. Ready Aug. 1. Crop, green, 11 lb.

* * *

58. FRANCONVILLE (Barr *).—Very vigorous, 18 to 20 inches, dark green ; pods in medium clusters, carried well above soil, up to 8 inches long, straight or somewhat curved, ⅔ to ½ inch diameter, flat round, smooth, medium green ; flesh thick, becoming stringy with age, and then bulging over seeds ; seeds up to 5, when ripe, black, long, cylindrical, rounded at ends. Ready July 20. Crop green, 11 lb.

* * *

59. NEGRO LONGPOD (R.H.S.). } Plant as above, pods as above, but 6½
60. MONSTER NEGRO (Sutton) } to 7½ inches, straight or somewhat curved, light green becoming purplish later ; seeds up to 6, larger and flatter than No. 58. Ready Aug. 1. Crop green, 11 lb.

* * *

62. NEGRO LONGPOD (Sydenham).—A mixed stock containing many runners.

* * *

57. EARLY BLACK WONDER (Barr *).—Plant as in No. 59, 60, but 18 inches ; pods in large clusters nearer centre of plant, mostly 8 inches long, ½ inch wide, medium green, mostly straight, rather rough ; flesh thick, stringy, and with parchment ; seeds up to 5 as in Nos. 59, 60. Ready July 22. Crop green, 7½ lb. Introduced by Messrs. Daniels.

* * *

63. EARLY BELGIAN NEGRO (Cooper-Taber).—Plant of 18 to 22 inches, dark green ; pods in medium clusters, carried well above soil, 6½ to 7 inches long, straight, flat, round, ⅔ to ½ inch wide, smooth, light dull green ; flesh thick, stringy ; seeds up to 7, when ripe, black, small, almost cylindrical, generally rounded at ends. Ready July 29. Crop green, 11½ lb.

* * *

64, 65. BLACK VALENTINE (Morse, Thorburn).—Plant of 18 to 20 inches, dark green ; pods in medium clusters, more or less above soil, 5½ inches long, slightly curved or straight, rather rough, medium green becoming purple later, roundish, ⅔ to ½ inch ; flesh thick, becoming stringy later ; seeds up to 6, when ripe, black, small, oval, generally truncate. Ready July 30. Crop green, 11½ lb. Somewhat variable in pod-shape from flat-round to round. No. 64 was more like No. 63 than was No. 65.

* * *

66. THE SHAH (Barr *), A.M. Aug. 21, 1919.—Plant very vigorous, 18 to 22 inches, dark green ; pods in medium clusters, well above soil, 6 to 6½ inches long, straight, smooth, light dull green, flat-round to round, about ⅔ inch diameter ; seeds up to 7, when ripe, medium cylindrical, ends rounded. Ready Aug. 14. Crop green, 12 lb.

* This sender does not yet list this variety.

h. Seeds black and white ; flower white.

- 68, 69, 252. SUPERLATIVE (Sutton, Barr, * Nutting)
70, 71. MAGPIE (Carter, Barr *)
75. MÉTIS (R.H.S.)
76. BLACK PRINCE (Barr *)

} A.M. Aug. 7, 1919.

Plant vigorous, 18 to 22 inches, dark green ; pods in large clusters, carried well above soil, $5\frac{1}{2}$ to $6\frac{1}{2}$ inches, straight, medium green, rather rough, nearly round, $\frac{3}{8}$ inch diameter ; flesh thick, with much string and parchment ; seeds up to 5 or 6, when ripe small, about $\frac{1}{2}$ black, $\frac{1}{2}$ white, cylindrical, ends rounded. Ready July 23. Crop green, up to 11 lb. Introduced to England from France by various seedsmen.

i. Seeds bright brown and white ; flowers white.

73. PRODIGIOUS (Carter)
74. FELTHAM PROLIFIC DWARF (Watkins & Simpson)

} A.M. Aug. 7, 1919.

The counterpart of Nos. 68, 69, &c., but with different coloured seeds. Ready July 24. Crop green, 10 lb. Introduced by senders.

j. Seeds dull brown, mottled pale brown ; flowers lilac.

67. HARICOT NAIN MERVEILLE DE PARIS (Vilmorin).—Plant vigorous, 18 inches, dark green ; pods in rather loose, large clusters, carried well above soil, $6\frac{1}{2}$ inches, straight or curved, medium dull green, more or less mottled with purple, rough, flat-round, $\frac{3}{8}$ inch diameter ; flesh thick, with little parchment or string when young, tough later ; seeds up to 7, when ripe of medium size, flat oval, ends round. Ready Aug. 1. Crop green, 8 lb.

k. Seeds and flowers white.

77. EXTRA EARLY WHITE FORCING (R.H.S.).—Plant fairly vigorous, 18 inches, dark green ; pods in large compact clusters, held well above soil, $5\frac{1}{2}$ inches, nearly straight, medium green, smooth, oval in section, $\frac{3}{8}$ inch diameter ; flesh thick, with much string but little parchment ; seeds up to 5, cylindrical, small, round at ends. Ready July 29. Crop green, 11 lb.

* * *
78. ÉTAMPES EARLY WHITE (Barr).—A mixed stock containing many climbers.

* * *
80, 81. WHITE MODEL (Carter, Barr *).—Plant large, erect, 18 inches, dark green ; pods in large, rather loose clusters, generally well above soil, 7 inches long, fairly straight, medium green, rather rough, $\frac{3}{8}$ to $\frac{1}{2}$ inch diameter, oval in section ; seeds up to 5, when ripe, medium size, long, flat oval, often truncate at end. Ready July 29. Crop green, 11 lb. Introduced by Messrs. Carter.

83. LONG WHITE CANTERBURY (Barr)
85. WHITE CANTERBURY (Huist)

} Plant fairly vigorous, 15 to 18

inches, dark green ; pods in medium, in rather large clusters, well above soil, 5 to $5\frac{1}{2}$ inches long, straight or somewhat curved, medium green, flattish, $\frac{1}{2}$ inch diameter ; flesh thick, at first little but becoming very stringy ; seeds up to 5, when ripe, large, long, oval, ends round. Ready Aug. 1. Crop green, $9\frac{1}{2}$ lb.

84. LONG WHITE CANTERBURY (R.H.S.).—An untrue stock.

86. IMPROVED WHITE CANTERBURY (Cooper-Taber).—Characters as in Nos. 83, 85, but pods tending to rest on soil, longer, up to $6\frac{1}{2}$ inches and straighter, containing up to 6 beans.

95. KING OF THE WHITE (Dawkins).—Characters as in Nos. 83, 85, but pods straight, 6 in. long. Crop green, 12 lb.

* * *
97. WONDERFUL WHITE HARICOT (Ryder).—A semi-climbing form with white seeds*

* * *
82. LONG-PODDER WHITE (R.H.S.)
98. FLAGEOLET BLANC A LONGUE COSSE (Vilmorin)

} Stocks need further selection.

90. WHITE QUEEN (Barr *).—Plant large, 18 inches, dark green ; pods in large compact clusters, held well above soil, $5\frac{1}{2}$ to $6\frac{1}{4}$ inches long, somewhat

* This sender does not yet list this variety.

curved, rough, medium green, $\frac{1}{2}$ inch diameter, oval in section; flesh thick, with little fibre or string when young, but becoming stringy, bulging over seeds; seeds 2 to 4, when ripe, large, straight, thick, ends more or less truncate. Ready July 29. Crop green, 12 lb. Said to be a white form of 'Canadian Wonder,' but quite distinct from the following (Nos. 88, 89, 96), which correspond exactly with 'Canadian Wonder' except in seed colour.

88. WHITE HARICOT (Sutton)

89. WHITE LEVIATHAN (Watkins & Simpson) } A.M. Aug. 21, 1919.

96. DUNKIN'S DWARF (Dunkin)

Plant vigorous, dark green, 18 to 22 inches, foliage large; pods in large clusters, carried well above soil, $6\frac{1}{2}$ to 7 inches long, straight or somewhat curved, smooth, light green, $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter, thick; flesh thick, little string or parchment at first, but becoming tough; seeds up to 6, when ripe large, kidney-shaped, flat oval. Ready July 29. Crop green, $13\frac{1}{2}$ lb. Introduced by senders.

91. WHITE DUTCH OR CASE KNIFE (Barr)

92. DWARF CASE KNIFE (R.H.S.)

} Of medium size, 16 inches, dark green; pods in small clusters, well above ground, 4 to $4\frac{1}{2}$ inches, smooth, straight, light green, $\frac{3}{4}$ inch diameter, flat; flesh thick with little string or parchment at first but becoming tough later; seeds up to 6, of medium size, flat oval, ends generally round. Ready Aug. 1. Crop green, $12\frac{1}{2}$ lb. Both stocks showed a tendency to climb.

93. EMPEROR WILLIAM (R.H.S.).—Closely resembles the preceding (Nos. 91, 92), pods sometimes longer.

94. HARICOT DE SOISSONS NAIN (R.H.S.).—Plant of 18 inches, rather spreading, dark green; pods in small clusters, well above soil, 5 inches, straight, smooth, light green, stringy when old, $\frac{3}{4}$ inch broad, flat; flesh fairly thick, becoming tough when old; seeds up to 5, when ripe of medium size, flat oval, end usually truncate. Crop green, 14 lb. Showing a tendency to climb.

241. KUMAMOTA (Yokohama Nursery Co.).—Plant of medium size, 15 inches, dark green; pods in medium clusters, resting more or less on the soil, 5 to $5\frac{1}{2}$ inches, straight, flattish, dark dull green, $\frac{7}{8}$ inch diameter; flesh medium, stringy, little parchment; seeds 5, variable in shape. Ready Aug. 15. Crop small.

87. NETTLE-LEAVED CANTERBURY (R.H.S.).—Plant of medium size, 12 to 16 inches, foliage small, very distinct by its marked wrinkling, dark green; pods in large clusters, rather loose and apt to rest on the soil, 4 to $4\frac{1}{2}$ inches long, more or less curved, dark green, smooth, flattish, barely $\frac{3}{4}$ inch diameter, flesh thick, stringy but with little parchment; seeds up to 5, crowded in the pods, when ripe flattish oblong, truncate at ends. Ready July 25. Crop green, 7 lb.

101. COMTESSE DE CHAMBORD OR DWARF RICE (Barr).—A semi-climbing form not needing support, medium dark green; pods in small clusters, carried well above soil, $3\frac{1}{2}$ inches long, light green, smooth, flattish oval, barely $\frac{1}{2}$ inch diameter; flesh fairly thick, becoming stringy when old; seeds 3 to 6, when ripe, very small, round oval, more or less truncate. Of value mainly for its ripe seeds. Ready Aug. 19. Crop green, 17 lb.

103, 104. HARICOT L'INÉPUISABLE (Vilmorin, Barr *).—Plant large, 14 to 18 inches, dark green; typically the flowers and pods of this form are produced in very large clusters, but many fail to set, production occurs over a long period, and the crop is very good, but all stocks contained some plants with rather small clusters; pods up to 6 inches, medium green, flattish, $\frac{3}{4}$ to $\frac{1}{2}$ inch diameter seeds 3 to 5, medium, flattish oval, truncate, but considerable variety of form was apparent in the stocks. Ready Aug. 18. Crop green, 13 lb.

243. EVERBEARING (Cave).—Characters as above.

105, 106, 107. EVERBEARING (Sutton, Barr, R. Veitch).—Earlier than Nos. 103, 104, but otherwise similar. Stock No. 107 showed the characteristics of this variety more markedly than the others.

* This sender does not yet list this variety.

l. Seeds green ; flowers white.

The forms included here have seeds green when ripe, but, in order to secure this green tinge unaltered, the pods must be harvested before they are quite ripe; the colour of the seeds is then a very pleasing green. Two distinct forms were included in the trial, but the form known as 'King of the Greens' or 'Roi des Verts' is usually regarded as the same as 'Wonder of France,' but was in this trial similar to 'Chevrier Vert,' etc. There are probably degrees of difference in the power of retaining the green colour in the seed, but the habit of the plants, characters of the pods, and so on, proved so much alike in the forms numbered 108 to 114 that we group them together.

- | | |
|-------------------------------------|------------------------------------|
| 108. CHEVRIER VERT (Carter) | } Plant of medium size, 18 inches, |
| 109. ROI DES VERTS (R.H.S.) | |
| 110. KING OF THE GREENS (Dawkins) | |
| 111. GREEN HARICOT (Barr) | |
| 112. DWARF GREEN (Ryder) | |
| 113, 114. GREEN GEM (Sutton, Barr*) | |

dark green; pods in large, loose clusters, carried well above soil, pods up to 6 inches long, straight or curved, medium green, oval in section, $\frac{3}{8}$ -inch diameter; flesh thick, tender but becoming stringy; seeds up to 5, green when ripe, of medium size, long, generally rounded at ends. Ready Aug. 3. Crop green, 13 lb.

* * *

115. WONDER OF FRANCE (R.H.S.).—Habit distinct from foregoing; crop not quite so heavy.

m. Seeds dark purple ; flowers lilac.

CANADIAN WONDER TYPE.—Two quite distinct races of 'Canadian Wonder' type are included, the one with larger, paler foliage, larger seeds and longer pods, and the other, smaller in all parts, darker and later. Between these are some intermediate forms, but many of the stocks now on the market contain both the smaller and the larger forms.

In our trials the large earlier form was represented by:

- | | |
|--|-----------------------|
| 158. CANADIAN WONDER SELECTED (Sutton) | } H.C. Aug. 21, 1919. |
| 159. CANADIAN WONDER (Carter) | |
| 161. CANADIAN WONDER, SELECTED STRAIN (Dobbie) | |

Plant vigorous, 22 inches, yellowish green; pods carried well above soil, up to 9 inches long, straight, rough, rather light green, flat oval, $\frac{1}{2}$ inch diameter; flesh thick, with little fibre at first, becoming stringy; seeds up to 6, when dry very large, almost straight, rounded. Ready Aug. 5. Crop green, 10 $\frac{1}{2}$ lb.

163. CANADIAN WONDER SELECTED (R.H.S.) belonged to same type.

The extreme small type was represented by

170. FLAGEOLET ROUGE NAIN (Vilmorin).

Other stocks either intermediate or mixed were:—

160. SELECTED CANADIAN WONDER (Webb).—Smaller type.
 162, 165, 167, 250. CANADIAN WONDER (Simpson, Veitch, Morse, Nutting).—Smaller type, intermediate.
 164. CANADIAN WONDER (Barr).—Mixed types.
 168. CANADIAN WONDER, IMPROVED (Ryder).—Smaller type, intermediate.
 169. CANADIAN WONDER, ORDINARY (Sutton).—Contained some runners.
 166. CANADIAN EXPRESS (Carter).—Smaller type, mixed.

n. Seeds white, with reddish-brown streak at edge : flowers white.

- | | |
|--|----------------------|
| 171, 172. MAGNUM BONUM (Sutton, Watkins & Simpson) | } Plant fairly large |
| 174. WHITE ADVANCER, IMPROVED (Carter) | |
- up to 18 inches, yellowish green becoming darker, rough; pods in small clusters well above foliage, 5 inches, straight, medium green, $\frac{3}{8}$ to $\frac{1}{2}$ inch diameter, flattish-round; seeds up to 6, when ripe, large, ends rounded. Ready Aug. 2. Crop green, 10 lb.

* This sender does not yet list this variety.

No. 171 and No. 174 each introduced by senders.

Stocks of this form usually contain a rogue with very similar seed, and this seems to have been selected out and called

173. GOLIATH (Barr).—A form with darker pods, but otherwise of the Magnum Bonum type.

o. Seeds pinkish-buff, striped purple; flower lilac.

128. SION HOUSE (Carter).—Plant of medium size, 15 inches, dark yellowish green; pods in medium clusters, well above soil, 5½ to 6 inches, straight, flattish oval, rough, medium dull green, more or less streaked red, ⅞ inch diameter; flesh thick, little string or parchment; seeds 4, when dry, oval, ends rounded, flat-round in section. Ready Aug. 5. Crop green, 9 lb. Introduced by Messrs. Veitch.

129. EARLY GEM (Dawkins).—Similar to preceding, but not so regular a stock, and contained round-podded type. Crop green, 6 lb.

131. BEST OF ALL (Barr).—Of same type as No. 128, but pods show seeds more and seeds are smaller.

132. EARLY PARISIAN (Barr)

133. HARICOT NAIN DE PARIS (R.H.S.) } Plant large, 18 inches, dark green; pods in medium clusters well above soil, 5 inches long, generally straight, oval in section, rough, medium dull green with more or less violet markings, ¾ inch diameter; flesh of medium thickness, rather tough and stringy; seeds up to 5, when ripe long oval, more or less truncate at ends. Ready July 24. Crop green, 9 lb.

177. PRINCE EDWARD (Dickson & Robinson) }

178. VICTORIA (Webb) } Description as Nos 132, 133. but plants a little dwarfer, and pods a little longer. Crop green, 11 lb.

p. Seeds pinkish-buff, much marbled purple; flowers lilac.

1. Flat-podded.

130. EARLY WARWICK (Watkins & Simpson).—Plant as No. 128; pods in small clusters, 4 inches long, straight, medium green, flat, ⅝ inch broad; flesh fairly thick, tough, and stringy; seeds up to 5, short thick oval. Ready July 26. Crop green, 6 lb.

2. Round-podded.

134. HARBINGER (Webb)

136, 137. PERFECTION (Watkins & Simpson, Barr) } Plant vigorous, 18

138. GRIS MARAÎCHER (R.H.S.) }

253. EMPEROR OF RUSSIA (Nutting)

inches; foliage more or less corrugated, dark green; pods in medium clusters well above soil, 5 to 6 inches, more or less straight, round medium green, ¾ inch diameter; flesh very thick, more or less stringy as they age; seeds up to 6, oblong, oval in section, ends rounded. Ready July 26. Crop green, 8½ lb.

135. PERFECTION (Sutton).—Characters as above but pods more uniformly round, and seeds of a brighter tint.

q. Seeds reddish brown on fawn ground; flowers lilac.

1. Flat-podded.

141, 142. EARLY FAVOURITE (Dawkins, R. Veitch).

143, 251. EARLIEST OF ALL (Watkins & Simpson, Nutting) } Plant fairly

144. EARLY PROLIFIC (Carter) }

148, 149. EARLY MOHAWK (Carter, Morse)

vigorous, 18 inches; foliage dark green, becoming corrugated; pods in medium clusters, well above soil, 5½ inches, usually straight, dark green, flat oval, ⅝ inch diameter; flesh medium, little parchment, but becoming stringy with age; seeds 6, large, oval, ends rounded. Ready July 24. Crop green, 6½ lb.

The truest stocks were Nos. 143, 251 'Earliest of All'; and No. 149 'Early Mohawk.' To these A.M. Aug. 7, 1919, was given.

146. CLUSTER (Webb).—Nearly related to foregoing; foliage paler; crop smaller.

2. Round-podded.

147. PERFECT (Bunning).—Plant of medium size, erect, 16 inches; foliage medium to dark green, flowers dark, in small clusters; pods set poorly but over long season, 4 to 4½ inches, fairly straight, medium green, marked with dark violet, smooth, round, ⅜ inch diameter; flesh very thick, no string at first, little parchment later; seeds 5, rather smaller but otherwise similar to No. 141. Ready Aug. 20. Crop green, 8½ lb.

r. Seeds blackish brown on fawn ground; flowers lilac.

145. FIFTY DAYS (Carter), A.M. Aug. 7, 1919.—Plant of medium size, erect, 16 inches; foliage medium green; pods in medium clusters, well above soil, 4½ inches, straight, light green, rather rough, ⅝ inch diameter, flat oval; flesh medium, stringy, but with little parchment; seeds similar to No. 141 except in colour. Ready July 20, the earliest bean in the trial. Crop green, 6 lb., season short.

s. Seeds flesh-coloured, much marbled purple violet; flowers dark mauve.

151. SUISSE GRIS (R.H.S.), H.C. Aug. 21, 1919.—Plant 18 inches, vigorous, with dark-green branches, and large, corrugated, dark-green leaves; pods in large clusters, well above soil, 4½ to 5 inches, straight, dark green more or less marked purple, ⅞ inch diameter; flesh thick, with little parchment and no string when young, becoming stringy later; seeds 3 to 5, large, straight, oval in section, round ended. Ready Aug. 2. Crop green, 11 lb.

* * *

155. ABUNDANCE (A. Dickson).—Plant like preceding; pods 4½ inches medium green, stringy, otherwise like No. 151. Seeds perhaps a little smaller. Ready Aug. 1. Crop green, 9 lb. Raised and introduced by Messrs. Dickson.

* * *

156. GLOIRE DE LYON (Barr *).—Plant as in No. 151. Pods in large clusters, resting on soil, 5½ to 6 inches long, somewhat curved, rough, medium green more or less marked dark violet, roundish oval, ⅜ inch diameter; flesh thick, tough, and stringy; seeds 3 to 5, darker than No. 151 when ripe. Ready July 24. Crop green, 7 lb.

* * *

157. PROGRESS (Dawkins).—Plant as in No. 156. Pods in large clusters tending to rest on soil, 4 inches long, slightly curved, rough, light green slightly streaked violet, ⅝ inch wide; flesh medium, tough, and stringy; seeds up to 5, similar to No. 156. Ready July 24. Crop green, 8 lb.

t. Seeds flesh-coloured, much marbled reddish brown; flowers light mauve.

150. EARLY WONDER (Ryder)

152. LANGPORT WONDER (Kelway); Plant 16 inches, dark green, vigorous; pods 5½ to 6 inches long in large clusters well above soil, straight, smooth, light to medium green, ⅞ inch; flesh fairly thick, little parchment, or string when young, becoming stringy; seeds up to 6, of medium size, flat oval, rounded at end. Ready Aug. 5. Crop green, 9½ lb. Germination of No. 150 poor.

u. Seed dark dun and white; flowers white.

175. SATISFACTION (Sutton), A.M. Aug. 7, 1919.—Plant 18 inches; foliage dark green, corrugated, large; pods in large clusters well above soil, up to 7 inches long, medium dull green, straight, flat oval, ⅝ inch; fleshy, with little parchment or string; seeds 6, medium, long flat oval, ends round. Ready July 24. Crop green, 8½ lb. Raised and introduced by Messrs. Sutton.

v. Seeds reddish brown with black splashes; flowers red.

176. EARLY WONDER (Carter), A.M. Aug. 7, 1919.—Plant 16 inches, erect; foliage large, rough, medium green; pods 4 to 5 inches, in large compact clusters more or less above soil, medium green, rounded in section, ⅝ inch; very fleshy with little fibre or string when young, becoming stringy later, rather bulged over seeds; seeds 6, small, short oval, rounded at ends. Ready Aug. 2. Crop green, 7½ lb. Produced over a long season.

* This sender does not yet list this variety.

LETTUCES AT WISLEY, 1919.

ABOUT two hundred and eighty stocks of Lettuce were sown at Wisley for trial in the spring of 1919. The ground on which the Cabbage Lettuces were sown had carried a crop of peas in 1918; after they were removed a dressing of pig manure was applied and the ground was dug. One row of seed (36 feet long) of each stock was sown on April 4. The drills were 2 feet 6 inches apart, and on May 12 sufficient seedlings were removed from each to form another row, so that the rows were finally 15 inches apart and the plants a foot apart in the rows, the final thinning being done on May 16. The land used for the Cos Lettuce had borne a crop of Climbing Beans in 1918, but was otherwise similar to the Cabbage Lettuce land and was prepared in the same way. The seed was sown on May 5 and seedlings were transplanted on May 26, the treatment being exactly the same as for the Cabbage Lettuce except that the transplanted rows were watered twice whereas the Cabbage varieties received no water. The ground was hoed frequently during the trial, and the plants almost without exception grew well. The rainfall during the period covered by the trial was very small, but the constant presence of a mulch of loose soil on the surface prevented the soil from becoming too dry. The rainfall measured was, for April 2.48 inches, May .24 inch, June 1.17 inch, July 2.66 inches.

It is to be noted that the transplanted plants were markedly behind those allowed to remain where the seed was sown, being at least a fortnight later in reaching maturity in most cases. The rate with which they ran to seed was not noticeably greater than that of the sown row. For other notes see under the different sections.

The Fruit and Vegetable Committee examined the Trial on several occasions and made the following recommendations for Awards:—

CUTTING AND BUNCHING LETTUCES.

Highly Commended.

No. 13. Golden Beauty, sent by Messrs. Barr.

{ No. 14. Early Curled Silesia or Simpson, sent by Messrs. Burpee.
Nos. 15, 16. Early Curled Simpson, sent by Messrs. Thorburn and Morse.

No. 17. Australian, sent by Messrs. Thorburn.

Nos. 18, 19, 20. Black-seeded Simpson, sent by Messrs. Morse, Thorburn, and Burpee.

CABBAGE HEARTING LETTUCES.

Award of Merit.

- No. 32. Giant Crystal Head, sent by Messrs. Thorburn.
- No. 33. Crystal Palace, sent by Messrs. Barr (**F.C.C.** 1898 [Watkins & Simpson]).
- Nos. 34, 35. Holborn Standard, sent by Messrs. Barr.
- Nos. 36-39. Iceberg, sent by Messrs. Thorburn, Morse, Dickson, and Burpee.
- No. 40. Supreme, sent by Messrs. Sutton (**A.M.** 1910 [Sutton]).
- No. 65. Iceleaf, sent by Messrs. R. Veitch (**A.M.** 1895 [R. Veitch]).
- No. 77. Large Parisian, sent by Messrs. Barr.*
- No. 57. Pierre Bénite, sent by Messrs. Barr.*
- Nos. 175, 261. Early Paris Market, sent by Messrs. Carter and Nutting.
- No. 12. Georges, sent by Messrs. Barr.*
- Nos. 105-108, 260. May King, sent by Messrs. Barr,* Morse, Thorburn, Burpee, and Nutting.
- No. 21. Tender and True, sent by Messrs. Barr.*
- No. 87. Market Favourite, sent by Messrs. Watkins & Simpson.
- Nos. 129, 130. Heartwell, sent by Messrs. Sutton and Barr (**A.M.** 1910 [Sutton]).
- No. 121. Wayahead, sent by Messrs. Barr.*
- No. 191. Standwell, sent by Messrs. Sutton.
- No. 170. Magnet, sent by Messrs. Webb.
- No. 112. Yellow-seeded Butter, sent by Messrs. Morse.
- No. 74. Percheronne, sent by Messrs. Barr.
- Nos. 90, 91, 92. California Cream Butter, sent by Messrs. Thorburn, Morse, and Burpee.
- Nos. 68, 69, 70, 267. Continuity, sent by Messrs. Carter, Veitch, Morse, and Nutting (**A.M.** 1901 [Hurst, R. Veitch]).
- No. 76. Satisfaction, sent by Messrs. Sutton.
- No. 123. Gloriosa, sent by Messrs. Barr.
- Nos. 156, 264. All the Year Round, sent by Messrs. Sutton and Nutting.

Highly Commended.

- Nos. 25, 26. New York, sent by Messrs. Morse and Thorburn.
- No. 27. The New Yorker or Neapolitan, sent by Messrs. Barr, (**A.M.** 1901 [Barr]).
- Nos. 24, 28, 29, 263. Webb's Wonderful, sent by Messrs. Webb, Sydenham, Thorburn, and Nutting.
- Nos. 48, 49. Duke of Cornwall, sent by Messrs. Veitch & Barr (**A.M.** 1901 [R. Veitch]).
- No. 23. Ar, sent by Messrs. Sutton.
- No. 276. Hercules, sent by Messrs. Dobbie.

* This sender does not yet list this variety.

No. 8. Harbinger Forcing, sent by Messrs. Barr (**H.C.** 1901 [Barr]).

No. 180. Marvel of Cazard, sent by Messrs. Barr.

{ Nos. 160, 161. Matchless, sent by Messrs. Sutton and Messrs. Barr.
No. 162. Round-leaved, sent by Messrs. Barr.
No. 164. Criterion, sent by Messrs. Webb.

No. 189. Commodore Nutt, sent by Messrs. Sutton (**A.M.** 1910 [Sutton]).

SEMI-COS VARIETIES.

Award of Merit.

No. 250. Winter Density, sent by Messrs. Toogood.

COS VARIETIES.

Award of Merit.

{ No. 247. Covent Garden Winter White }
{ No. 235. Early Frame } sent by Messrs. Barr.
{ No. 236. Beauty of Versailles }

No. 217. St. Albans All Heart, sent by Messrs. Harrison (**A.M.** 1901 [Hurst]).

No. 254. Dwarf White Heart, sent by Messrs. Burpee.

{ No. 207. The Barnum, sent by Messrs. Barr.
No. 228. Mammoth Cos, sent by Messrs. R. Veitch.
Nos. 255, 256, 257. Balloon, sent by Messrs. Thorburn, Sydenham, and Barr (**A.M.** 1895 [Vilmorin]).
No. 259. Exhibition, sent by Messrs. Webb.

Highly Commended.

{ No. 208. All Heart, sent by Messrs. Barr.

{ No. 209. White Heart, sent by Messrs. Sutton.

No. 211. Lobjoit's Green Cos, sent by Messrs. Watkins & Simpson.

No. 215. Emerald Queen, sent by Messrs. Barr (**H.C.** 1909 [Barr]).

No. 231. Monstrous White, sent by Messrs. Webb.

Nos. 246, 248. Winter White, sent by Messrs. Webb and Sutton.

No. 227. Giant White, sent by Messrs. Barr.

Nos. 195, 196. Dwarf Perfection, sent by Messrs. Barr and Sutton (**A.M.** 1901 [Barr]).

No. 237. Alexandra, sent by Messrs. Barr.

NOTE.—The following varieties which had gained awards in earlier trials were represented in the present one, but on this occasion were passed over by the Committee.

No. 102, Big Boston (**A.M.** 1901 [Masters]); No. 110, White Favourite (**A.M.** 1910 [Barr]); No. 117, White Chavigné (**F.C.C.** 1883 [Vilmorin]); No. 166, Little Gem (**A.M.** 1901 [Barr]); No. 81, Giant (**H.C.** 1909 [Sutton]); No. 169, Green Favourite (**A.M.** 1910 [Barr]); No. 251, Chesnay Large White (**H.C.** 1909 [Vilmorin]); No. 250, Covent Garden Summer White (**H.C.** 1909 [Barr]); Nos. 218, 219, Jumbo (**A.M.** 1901 [Barr, Carter]); No. 205, Walker's Sugar Loaf (**F.C.C.** 1869 [Nutting], to Brown Sugar Loaf).

The number of varieties of lettuce is very large, and many of the main forms have been in cultivation for a very long time. Although the extreme forms are very different from one another, all gradations between them are to be found, and there is little doubt that all have been derived from one original wild plant, in all probability *Lactuca Scariola*, a native of Central Europe and Asia. The striking differences between the forms are mainly seen before the flowering stage is reached ; when in flower, though differences exist, they are much less evident or profound.

The most striking difference between the many varieties is seen in the form of the leaf. In one large group it is much longer than broad, almost spoon-shaped, while in another it is at least as broad as long. The two sections thus separated are known respectively in gardens as 'Cos' and 'Cabbage' Lettuces. A few varieties occur which are neither clearly Cos nor Cabbage, and these we have called 'Semi-Cos' in the arrangement of the varieties given below. In each of the groups we find parallel variations, though the parallelism is perhaps not always at first apparent. In both groups we find varieties (1) with their leaves deeply cut at the margins and others with leaves almost entire ; (2) with tightly folded hearts and without hearts ; (3) of all shades of colour from light yellowish green to deep green with or without less or more red until the whole leaf is as purplish in tone as a copper beech ; (4) differing in size ; (5) maturing, *i.e.* becoming ready for use, quickly or less quickly ; (6) running quickly to seed or remaining long before producing flower-stalks ; (7) withstanding our winter climate or suffering more or less from it ; (8) having white, black, or occasionally yellow (which we have not met with in Cos varieties) seeds. Other differential characters are found in the flat or blistered surface of the leaf, and in the more subtle distinctions of flavour, crispness, and so on. This list does not exhaust the possibilities and there are thus a great many possible combinations of characters, and there is little wonder that the number of varieties in cultivation is so great.

The plant appears to offer an interesting object of research to the Mendelian, but the research would be easier to carry out in a warmer country than our own, for the ripening of seed is not by any means certain in most years in England with most varieties. There is also further complication common to all Composites—the difficulty in securing certain crossing. In places where seed is saved the plant appears to be mainly self-fertilized, but occasionally crossing undoubtedly occurs, for from certain sources the seed from green plants almost always produces a few reddish roguers.

In the following notes on the plants in the Trial we have divided the Lettuces primarily into Non-hearting or Cutting Varieties, Cabbage Varieties, Semi-Cos Varieties and Cos Varieties, each group being subdivided as seemed convenient in dealing with the plants grown.

NOTE 1. It is important to bear in mind that some of those varieties which in our Trial ran very quickly to seed when sown in spring,

and which were not capable of withstanding weather conditions in the Trial carried out during the winter of 1917-18 (see p. 354), may yet be excellent for another system of cultivation, viz. growing under glass for winter or spring use. This form of cultivation is not here reported upon.

NOTE 2. The arrangement given below brings together, as a rule, those varieties which are most nearly alike. The forms grouped closely together may be regarded as so nearly alike, even when not identical, that for practical purposes any one will serve the same purpose as the others adjacent to it in the garden. It is, however, important to observe that Awards are not given to varieties as such: they are given to strains, and as one strain of a variety may be truer, more regular, or freer from rogues than another of the same variety, an award is given to the truest strain, *i.e.*, the one of greatest value in the garden.

VARIETIES.*

- | | |
|---|---|
| 1. †Endive-leaved, A. I. b. 1 | 36. Iceberg |
| 2. Green Fringed Salad, A. I. a. | 37. " } B. I. a. 2. |
| 3. New Brown Oak-leaved, A. I. b. 2. | 38. " } |
| 4. Tomhannock, A. II. a. 1. | 39. " } |
| 5. Prize Head, A. II. a. 1. | 40. Supreme, B. I. a. 2. |
| 6. American Gathering } A. II. a. 1. | 41. Perpetual } B. I. a. 6. |
| 7. " " } | 42. " } |
| 8. Harbinger Forcing, B. I. a. 8. | 43. Favourite, B. I. a. 6. |
| 9. Winter Gathering, A. II. b. 2. | 44. Denver Market } B. I. a. 6. |
| 10. Grand Rapids Forcing, A. II. b. 2. | 45. " " } |
| 11. Grand Rapids, A. II. b. 2. | 46. Ohio Cabbage, B. I. a. 6. |
| 12. Georges, B. II. a. 1 (a). | 47. Ohio, B. I. a. 6. |
| 13. Golden Beauty, A. II. a. 2. | 48. Duke of Cornwall } B. I. a. 3. |
| 14. Early Curled Silesia or Simpson, A. II. a. 2. | 49. " " } |
| 15. Early Curled Simpson } A. II. a. 2. | 50. Giant Glacier, A. II. a. 3. |
| 16. " " } | 51. Drumhead or Malta, B. I. a. 5. |
| 17. Australian, A. II. a. 3. | 52. Drumhead Selected, B. I. a. 5. |
| 18. Black Seeded Simpson, A. II. b. 1. | 53. Improved Drumhead, B. I. a. 7. |
| 19. Black Seeded Simpson, A. II. b. 1. | 54. Curled Batavian, B. I. a. 8. |
| 20. Black Seeded Simpson, A. II. b. 1. | 55. Improved Batavian, B. I. a. 8. |
| 21. Tender and True, B. II. a. 1 (a). | 56. Golden Curled, B. I. a. 8. |
| 22. Mignonette, B. I. b. 1. | 57. Pierre Bénite, B. I. a. 2. |
| 23. Al, B. I. a. 3. | 58. Hanson } B. I. a. 8. |
| 24. Wonderful, B. I. a. 3. | 59. " " } |
| 25. New York } B. I. a. 3. | 60. Improved Hanson, B. I. a. 8. |
| 26. " " } | 61. McHattie's Giant } B. II. a. 2 (b). |
| 27. The New Yorker, syn. Neapolitan, B. I. a. 3. | 62. " " } |
| 28. Wonderful } B. I. a. 3. | 63. The Moor, B. II. c. 1 (a). |
| 29. " " } | 64. Giant Summer Brown, B. II. b. 1. |
| 30. Brittle Ice, B. I. a. 4. | 65. Iceleaf, B. I. a. 2. |
| 31. New Brittle Ice, B. I. a. 4. | 66. Exeter Winter Giant, B. II. a. 1 (b). |
| 32. Giant Crystal Head, B. I. a. 2. | 67. Early Red Spotted, B. II. a. 1 (b). |
| 33. Crystal Palace, B. I. a. 2. | 68. Continuity } B. II. c. 1 (b). |
| 34. Holborn Standard } B. I. a. 2. | 69. " " } |
| 35. " " } | 70. " " } |
| | 71. " " } B. II. c. 1 (a). |
| | 72. Hardy Red Winter, B. II. a. 1 (c). |
| | 73. Reliance, B. II. c. 1 (b). |
| | 74. Percheronne, B. II. c. 1 (b). |
| | 75. Brown Dutch, B. II. c. 1 (b). |
| | 76. Satisfaction, B. II. c. 1 (b). |

* See footnote, p. 120.

† The letters and numbers following the name of the variety indicate its position in the classified list which follows.

77. Large Parisian, B. I. a. 2.
78. Naumberger or Tenderheart, B. II. c. 1 (b).
79. Stanstead Park, B. II. a. 1 (a).
80. Maximum, B. II. c. 1 (a).
81. Giant, B. II. c. 1 (a).
82. Red Fringed, B. I. a. 1.
83. New Winter Fringed, B. I. a. 8.
84. Madrid Green, C. I.
85. Paris Stonehead, B. I. a. 8.
86. Autumn Queen, B. II. c. 1 (a).
87. Market Favourite, B. II. a. 2 (b).
88. Early Spring, B. I. a. 8.
89. Madeira Large Winter, B. II. a. 1 (a).
90. California Cream Butter, B. II. c. 1 (b).
91. California Cream Butter, B. II. c. 1 (b).
92. California Cream Butter, B. II. c. 1 (b).
93. Tremont Winter, B. II. a. 1 (a).
94. Grand Admiral, B. II. a. 1 (b).
95. Black-seeded Big Boston, B. II. c. 1 (a).
96. Black-seeded Big Boston, B. II. c. 1 (a).
97. Improved Big Boston, B. II. a. 1 (b).
98. Sans Rivale, B. II. a. 2 (b).
99. Unrivalled, B. II. a. 2 (b).
100. Trocadero } B. II. a. 1 (b).
101. " }
102. Big Boston, B. II. a. 1 (b).
103. Ideal } B. I. a. 1 (b).
104. " }
105. May King }
106. " " } B. II. a. 1 (a).
107. " " }
108. " " }
109. Bouchardat, B. II. a. 1 (c).
110. White Favourite, B. II. a. 2 (c) (1).
111. Madrilene, C. I.
112. Yellow-seeded Butter, B. II. b. 2.
113. Mammoth Green, B. II. a. 2 (d) (2).
114. All Seasons } B. II. c. 2 (a).
115. " " }
116. " " } B. II. a. 2 (a).
117. White Chavigné, B. II. a. 2 (c) (1).
118. Wayahead } B. II. a. 2 (c) (2).
119. " }
120. Earliest Wayahead, B. II. a. 2 (c) (2).
121. Wayahead, B. II. a. 2 (c) (2).
122. Covent Garden Winter White, B. II. a. 2 (d) (3).
123. Gloriosa, B. II. c. 2 (b) (3).
124. Masterpiece, B. I. a. 5.
125. Hammersmith or Hardy Winter Green, B. II. a. 2 (c) (1).
126. Winter Green, B. II. c. 3 (c).
127. Yates' Winter, B. II. a. 2 (c) (1).
128. Exeter Winter Giant, B. II. a. 1 (b).
129. Heartwell } B. II. a. 2 (b).
130. " }
131. Nansen, B. II. a. 2 (d) (3).
132. Hubbard's Market, B. II. a. 2 (c) (2).
133. Hubbard's Market, B. II. a. 2 (c) (2).
134. White Summer Cabbage, B. II. a. 2 (c) (2).
135. Schofield's Hardy Winter, B. II. a. 2 (d) (3).
136. White Madeira, B. II. c. 3 (c).
137. Queen of Summer, B. II. a. 2 (c) (2).
138. Summer Queen, B. II. a. 2 (c) (1).
139. Deacon } B. II. a. 2 (c) (1).
140. " }
141. Deacon Lettuce or San Francisco Market, B. II. a. 2 (c) (1).
142. Paragon, B. II. a. 1 (b).
143. " } B. II. a. 2 (c) (1).
144. Vauxhall Defiance, B. II. a. 2 (c) (1).
145. Pioneer, B. II. a. 2 (c) (1).
146. New Summer, B. II. a. 2 (d) (1).
147. Magnum Bonum, B. II. b. 3.
148. Brittany Winter White, B. II. c. 2 (b) (2).
149. Mammoth Black-seeded Butter, Thorburn's Selection, B. II. c. 3 (a) (2).
150. Mammoth Black-seeded Butter, B. II. c. 3 (a) (2).
151. Exhibition Giant, B. II. a. 2 (d) (1).
152. Improved Salamander, B. II. c. 2 (b) (2).
153. Salamander, B. II. c. 2 (b) (2).
154. Exhibition, B. II. c. 2 (b) (2).
155. All the Year Round, re-selected, B. II. c. 3 (b) (2).
156. All the Year Round } B. II. c. 3
157. " " } (b) (2).
158. " " }
159. Early Market All Heart, B. II. c. 2 (c).
160. Matchless } B. II. c. 3 (b) (2).
161. " }
162. Round-leaved, B. II. c. 3 (b) (2).
163. Beauty of Lille, B. II. c. 3 (a) (2).
164. Criterion, B. II. c. 3 (b) (2).
165. Monument, B. II. a. 2 (d) (3).
166. Little Gem, B. II. a. 2 (e) (2).
167. White Tennisball, Laitue gotte, B. II. a. 2 (e) (3).
168. White-seeded Tennisball, B. II. a. 1 (a).
169. Green Favourite, B. II. c. 2 (b) (1).
170. Magnet, B. II. a. 2 (d) (2).
171. Golden Ball, B. II. a. 2 (f).
172. Golden Queen Forcing, B. II. a. 2 (f).
173. Royal Albert, B. I. a. 2.
174. Early Paris Cutting, B. II. a. 2 (d) (3).
175. Early Paris Market, B. II. a. 1 (a).
176. Early Paris Market Forcing, B. II. a. 2 (d) (3).
177. Early Paris, B. II. c. 2 (d).
178. Greatheart, B. I. a. 6.
179. Covent Garden Summer White, B. II. a. 2 (d) (3).

180. Marvel of Cazard, B. II. *c.* 3 (a) (1).
 181. Buttercup, syn. Golden Ball, Rudolph's Favourite, B. II. *a.* 2 (f).
 182. Buttercup (failed).
 183. Earliest of All, B. II. *a.* 2 (d) (5).
 184. Lemon Queen, B. II. *a.* 2 (f).
 185. Tom Thumb, Wheeler's, B. II. *c.* 3 (d) (2).
 186. Tom Thumb, ordinary, B. II. *c.* 3 (c).
 187. Tom Thumb, Barr's Selected, B. II. *c.* 3 (d) (2).
 188. Tom Thumb Improved, B. II. *c.* 3 (d) (2).
 189. Commodore Nutt, B. II. *c.* 3 (d) (1).
 190. Tom Thumb, B. II. *c.* 3 (d) (2).
 191. Standwell, B. II. *a.* 2 (d) (2).
 192. Little Gem or Sucrine } C. II.
 193. " " }
 194. " " }
 195. Dwarf Perfection } D. I. *a.* 2.
 196. " " }
 197. Winter Red, D. II. *a.* 2 (a).
 198. Blood-red Winter, D. II. *a.* 2 (a).
 199. Black seeded Bath Cos, D. II. *a.* 2 (a).
 200. Giant Bath Cos, D. II. *a.* 2 (a).
 201. Black-seeded Bath Cos, D. II. *a.* 2 (a).
 202. Black-seeded Bath, D. II. *a.* 2 (a).
 203. Champion Brown, D. II. *a.* 2 (b).
 204. Covent Garden Winter Brown, D. II. *a.* 2 (a).
 205. Walker's Sugarloaf, D. II. *a.* 1.
 206. Solid Brown, D. II. *a.* 1.
 207. The Barnum, D. II. *b.*
 208. All Heart, D. I. *a.* 1.
 209. White Heart, D. I. *a.* 1.
 210. Sharpe's Standard, B. II. *a.* 1 (a).
 211. Lobjoit's Green Cos, D. I. *a.* 1.
 212. Dreadnought, D. II. *b.*
 213. Express Cos, D. I. *a.* 2.
 214. Express or Eclipse, D. I. *a.* 2.
 215. Emerald Queen, D. I. *a.* 1.
 216. Green Provence, D. I. *b.* 2.
 217. St. Albans All Heart, D. I. *c.* 1.
 218. Jumbo } D. I. *d.* 1.
 219. " " }
 220. Giant White } D. I. *b.* 1.
 221. " " }
 222. Hicks' Hardy White Winter Cos, D. I. *c.* 4.
 223. Hardy White, D. I. *c.* 4.
 224. Superior Hardy White, D. I. *c.* 1.
 225. Early French Market, D. I. *b.* 2.
 226. Kingsholm, D. I. *d.* 3.
 227. Giant White, D. I. *d.* 3.
 228. Mammoth Cos, D. II. *b.*
 229. Mammoth White, D. II. *b.*
 230. Winter Density, C. II.
 231. Monstrous White, D. I. *b.* 1.
 232. Moor Park, D. I. *c.* 2.
 233. Sh rpe's Standard White, D. I. *c.* 1.
 234. Superb White, D. I. *c.* 1.
 235. Early Frame, D. I. *b.* 2.
 236. Beauty of Versailles, D. I. *b.* 2.
 237. Alexandra, D. I. *c.* 1.
 238. Trianon } D. I. *c.* 1.
 239. " " }
 240. Trianon or Romaine, D. I. *c.* 1.
 241. London White, D. I. *c.* 3.
 242. White Cos, D. I. *c.* 3.
 243. Summer White, D. I. *c.* 1.
 244. Prince of Wales, wrongly named.
 245. Davis' Hardy Green, D. I. *c.* 1.
 246. Winter White, D. I. *d.* 2.
 247. Covent Garden Winter White, D. I. *b.* 2.
 248. Winter White, D. I. *d.* 2.
 249. White Paris Self-Folding, D. I. *c.* 1.
 250. Covent Garden Summer White, D. I. *c.* 1.
 251. Chesnay Large White, D. I. *c.* 1.
 252. Peerless, B. II. *a.* 2 (e) (1).
 253. " D. I. *c.* 1.
 254. Dwarf White Heart, D. I. *c.* 2.
 255. Balloon Cos } D. II. *b.*
 256. " " }
 257. " " }
 258. Nonsuch, C. II.
 259. Exhibition Cos, D. II. *b.*
 260. May King, B. II. *a.* 1 (a).
 261. Early Paris Market, B. II. *a.* 1 (a).
 262. Unrivalled, B. II. *a.* 2 (b).
 263. Wonderful, B. I. *a.* 3.
 264. All the Year Round, B. II. *c.* 3 (b) (2).
 265. Tom Thumb, B. II. *c.* 3 (d) (2).
 266. Golden Queen, B. II. *a.* 2 (f).
 267. Continuity, B. II. *c.* 1 (b).
 268. Winter Beauty, B. II. *c.* 1 (b).
 269. Red Forcing, B. II. *a.* 1 (a).
 270. Victoria Red, B. II. *a.* 1 (b).
 271. Early Long Keeper, B. II. *c.* 3 (b) (1).
 272. Giant Bossin, B. I. *b.* 2.
 273. Giant Golden Bossin, B. I. *a.* 8.
 274. Leviathan, D. II. *a.* 2 (a).
 275. Dwarf White Heart, D. I. *c.* 2.
 276. Hercules, B. I. *a.* 3.
 277. Philadelphia Early White, B. II. *a.* 2 (d) (4).
 278. Unrivalled, B. II. *a.* 2 (b).
 279. Forcing Milly, B. II. *a.* 2 (d) (4).

NOTES AND DESCRIPTIONS.*

A. Cutting or Bunching Lettuces.

The 'Cutting or Bunching' Lettuces never form a heart, but produce large numbers of leaves somewhat loosely arranged. When these are cut others grow so as to give a successional supply for salad purposes from a comparatively

* See Note 2, p. 338.

small space. Several of the Cabbage types of lettuce also will sprout after the hearts are cut, but they are rarely very satisfactory so treated. The 'Cutting and Bunching' Lettuces are little grown or known in the British Isles, although well known both on the Continent and in America. Several other varieties besides those mentioned below, some of which occasionally appeared in our trials, are catalogued abroad. Almost all stand dry weather well without running to seed.

I. CENTRAL LEAVES LOOSELY BUNCHED.

a. *Seeds white.*

2. GREEN FRINGED SALAD (Barr).—A medium-sized plant with regularly-arranged rosette of pale green much-fringed leaves, of fair quality, mild and tender. Mature June 25. Very slow to run. A very ornamental plant.

b. *Seeds black.*

1. Dark dull green.

1. ENDIVE-LEAVED (Barr *).—Of medium size, with deeply-lobed more or less erect leaves of bitter flavour, and rather coarse texture. Mature June 17. Slow to run.

2. Medium dark green.

3. NEW BROWN OAK-LEAVED (Barr *).—Of large size, with lobed more or less erect, bitter but tender leaves. Mature June 9. Quickly running. In spite of its name, had no trace of brown. [Note.—There is a brown variety of this type.]

II. CENTRAL LEAVES TIGHTLY BUNCHED.

a. *Seeds white.*

1. Foliage more or less tinged red-brown.

4. TOMHANNOCK (Burpee).—Very large; leaves broad, blistered, light green within but exposed parts dark brown-red; of good quality, somewhat bitter and tender. Mature June 16. Very slow to run.

5. PRIZE HEAD (Morse).—Indistinguishable from No. 4.

6. AMERICAN GATHERING (Barr *).—Description as No. 4.

7. AMERICAN GATHERING (Thorburn).—Similar to No. 4, but leaves rather more cut and blistered and of a darker tinge.

2. Foliage medium dull green.

13. GOLDEN BEAUTY (Barr *), H.C. June 13, 1919.—Large; leaves broad, blistered, of good quality, bitter and tender. Mature June 20. Very slow to run. Some tendency to heart.

14. EARLY CURLED SILESIA or SIMPSON (Burpee) }

15, 16. EARLY CURLED SIMPSON (Thorburn, Morse) }

H.C. June 13, 1919.—

Very large, and perhaps rather more blistered than No. 13, otherwise similar.

3. Foliage light green.

17. AUSTRALIAN (Thorburn), H.C. June 13, 1919.—Similar to Nos. 14 to 16, but paler.

50. GIANT GLACIER (Burpee).—Very large, and somewhat like Nos. 14 to 16, but with a greater tendency to heart when planted close, forming a transition to the hearting types.

b. *Seeds black.*

1. Foliage medium dull green.

18, 20. BLACK SEEDED SIMPSON (Morse, Burpee) }

19. SIMPSON BLACK SEED (Thorburn) }

H.C. June 13, 1919.—

Very large; leaves broad, blistered, somewhat darker than 'Early Curled Simpson,' of good quality and crisp. Mature June 16. Ran to seed very slowly.

* This sender does not yet list this variety.

2. Foliage light dull green.

9. WINTER GATHERING (Sutton).—Very large; foliage broad, much blistered and frilled, crisp and decidedly bitter. Mature June 16. Very slow to run to seed.
10, 11. GRAND RAPIDS FORCING (Thorburn, Burpee).—Description as No. 9.

B. Cabbage Hearting Lettuce.

The Cabbage Lettuces which form hearts fall into two large groups, those with distinctly crisp leaves, somewhat like the Cos Lettuce, brittle and usually glossy on the veins, and those with the inner leaves scarcely crisp but rather buttery in texture. The latter are perhaps best known and find the greatest favour in British gardens, but the former contain many excellent lettuces and may be grown where Cos Lettuces fail from various causes. Until recently the Cabbage Lettuce found little favour in the market after the end of May or beginning of June, but it is now being more greatly appreciated by the marketing public and finds a sale much later in the season.

I. CRISP HEARTING.*a. Seeds white.*

1. Foliage reddish brown.

82. RED FRINGED (Barr *).—Large; foliage broad, much blistered and crumpled, heart firm, of fair quality. Mature July 1. Slow to run to seed. Stock not quite true.

2. Foliage medium green, margins red.

32. GIANT CRYSTAL HEAD (Thorburn), A.M. June 23, 1919.—Very large, but not spreading widely; foliage blistered and not much crumpled, hearts fairly firm, crisp, of good quality and mild. Mature June 20. Very slow in running to seed.

33. CRYSTAL PALACE (Barr)

34, 35. HOLBORN STANDARD (Carter, Barr)

36, 37, 38, 39. ICEBERG (Thorburn, Morse, Dickson, Burpee)

40. SUPREME (Sutton)

65. ICELEAF (R. Veitch)

77. LARGE PARISIAN (Barr *)

A.M. June 23,
1919.—Description as
No. 32.

57. PIERRE BÉNITE (Barr *), A.M. June 23, 1919.—Similar to foregoing, but somewhat smaller.

173. ROYAL ALBERT (R. Veitch).—Somewhat like Nos. 32 to 40 but smaller and rather less regular, running to seed more quickly.

3. Foliage dark dull green, margins paler.

- 25, 26. NEW YORK (Morse, Thorburn), H.C. June 13, 1919.—Very large, but not spreading unduly; foliage somewhat blistered and undulate at margin; hearts firm, of fair quality, crisp and of mild flavour. Very slow to run.

27. THE NEW YORKER or NEAPOLITAN (Barr), H.C. June 13, 1919.—Description as Nos. 25, 26.

- 24, 28, 29, 263. WEBB'S WONDERFUL (Webb, Sydenham, Thorburn, Nutting), H.C. June 13, 1919.—Description as Nos. 25, 26.

- 48, 49. DUKE OF CORNWALL (Veitch, Barr *).—Description as Nos. 25, 26, but stocks not true, and irregular in hearting.

23. AI (Sutton), H.C. June 13, 1919.—Description as Nos. 25, 26.

276. HERCULES (Dobbie), H.C. June 13, 1919.—Description as Nos. 25, 26.

[Note.—'New York' as originally sent out was identical with the old 'Neapolitan' which has now almost disappeared, having been superseded by the lighter form now described and long known as 'Webb's Wonderful'.]

4. Foliage medium dull green, scarcely blistered.

30. BRITTLE ICE (Morse).—Very large, but not widely spreading; border of leaves not blistered, undulate; hearts hard, of good quality, very crisp and bitter. Mature June 26. Very slow to run to seed.

31. NEW BRITTLE ICE (Thorburn).—Like No. 30.

* This sender does not yet list this variety.

5. Foliage medium dull green.

51. DRUMHEAD OR MALTA (Morse).—Medium to large; foliage blistered and somewhat undulate at margin; hearts poor, crisp and mild. Bolted quickly.

52. DRUMHEAD SELECTED (Barr).—Very large. A poor stock; many did not form heads and others bolted quickly.

124. MASTERPIECE (Chalice).—Very large, compact; foliage blistered and crumpled, somewhat undulate at margin; hearts firm, of good quality, mild and sweet, crisp. Ready July 4. Slow to run.

6. Foliage light medium dull green, margins paler.

41, 42. PERPETUAL (Carter, Barr*).—Large but not widely spreading; foliage blistered and undulate; hearts light green, firm, crisp, of fair quality and slightly bitter. Mature June 20. Very slow to run.

43. FAVOURITE (Sutton).—Description as Nos. 41, 42, but standing longer than any other lettuce.

44, 45. DENVER MARKET (Thorburn, Morse).—Description as Nos. 41, 42.

46, 47. OHIO CABBAGE (Morse, Simpson).—Description as No. 46.

This section bears some resemblance to Section A. II. a. 2, but makes firm hearts, and the head leaves overlap so closely that the flower-stalk cannot get out for a long time. It may frequently be found curled up within the head in the longest standing forms.

178. GREATHEART (Webb).—Medium large to large, compact; leaves blistered and undulate; heads firm, of good quality, crisp, mild and sweet. Slow but rather irregular in running to seed. Ready June 24.

7. Foliage light medium dull green.

53. IMPROVED DRUMHEAD (Sutton).—Very large, spreading; leaves blistered and crumpled; heads soft, and rather loose, crisp, bitter, and of fair quality. Few plants formed heads, but all ran to seed slowly. Ready July 6.

8. Foliage light green.

54. CURLED BATAVIAN (Barr*)

55. IMPROVED BATAVIAN (Barr*) } —Very similar to No. 53, but rather paler in colour. Like that variety, only a proportion formed heads.

56. GOLDEN CURLED (Morse).—Similar in habit to Nos. 54 and 55; becoming almost yellow when mature. Very slow in running to seed. Ready July 6.

273. GIANT GOLDEN BOSSIN (Barr*).—Very large, spreading; leaves fringed and somewhat blistered; hearts fairly firm, of good quality, slightly bitter, crisp. Ready July 17. Slow in running to seed.

85. PARIS STONEHEAD (Barr*).—Large, compact; leaves less fringed than No. 273, blistered and crumpled; hearts firm, of good quality, rather bitter, crisp. Ready July 3.

88. EARLY SPRING (Simpson).—Rather larger than No. 85 and more blistered, margins much frilled; hearts fairly firm, of good quality, bitter and crisp. Ready June 19. Slow to run. Somewhat similar to 'Ohio' type, but with larger Savoy-like heads.

8. HARBINGER FORCING (Barr), H.C. June 13, 1919.—Very large, rather spreading; foliage somewhat frilled, much blistered; hearts firm, very pale green when mature, of good quality, bitter, crisp. Ready June 16. Very slow to run to seed.

58, 59. HANSON (Morse, Burpee)

60. IMPROVED HANSON (Thorburn) } —Very large, fairly compact; foliage somewhat blistered, frilled; hearts firm, of good quality, mild, tender. Ready June 26. Very slow to run. No. 60 not quite so regular a stock.

* This sender does not yet list this variety.

83. NEW WINTER FRINGED (Barr *).—Large, fairly compact ; leaves blistered and frilled, slightly darker than Nos. 58 to 60 ; hearts firm, of fair quality, mild, crisp. Ready June 21. Ran to seed slowly.

b. Seeds black.

1. Small.

22. MIGNONETTE (Thorburn).—Small to medium and compact ; foliage medium brown on dark green, blistered and crumpled, margins serrate and undulate ; heads firm, of good quality, slightly bitter and crisp. Ready June 16. Very slow to run, but not quite regular in this character.

2. Very large.

272. GIANT BOSSIN (Barr *).—Rather spreading ; medium dull green, margins reddish brown ; somewhat blistered ; heads fairly firm, crisp, but rather coarse. Ready July 10. Slow to run. Stock not quite true.

II. SMOOTH HEADING, OF BUTTERY TEXTURE.

a. Seeds white.

1. Foliage medium green tinged more or less red.

(a) Medium size.

175, 261. EARLY PARIS MARKET (Carter, Nutting), A.M. June 23, 1919.—Compact ; foliage somewhat blistered, more or less tinged red ; hearts firm, somewhat bitter, tender, of good quality. Ready June 16. Not standing long.

12. GEORGES (Barr *), A.M. June 13, 1919.—Indistinguishable from Nos. 175, 261.

105, 106, 107, 108, 260, MAY KING (Barr, * Morse, Thorburn, Burpee, Nutting), H.C. June 13, 1919.—Not quite so regular in running to seed as Nos. 175, 261, but otherwise indistinguishable.

21. TENDER AND TRUE (Barr *), A.M. June 13, 1919.—Similar to foregoing, but slow to run to seed.

269. RED FORCING (Barr *).—Rather smaller than No. 21, and perhaps more crumpled in foliage. Ready June 18. Not standing long.

168. WHITE-SEEDED TENNISBALL (Morse).—Bolted very quickly.

93. TREMONT WINTER (Barr *).—See Winter Lettuces (p. 354). Bolted when sown in spring without hearting.

89. MADEIRA LARGE WINTER (Barr *).—See note under No. 93.

79. STANSTEAD PARK (Dobbie).—See note under No. 93.

210. SHARPE'S STANDARD (Barr *).—Ran to seed without hearting.

(b) Medium large.

142. PARAGON (Webb).—Compact ; foliage more or less blistered and undulate at margins, which are tinged reddish brown ; heads firm, of good quality, bitter and tender. Ready June 19. Slow to run.

100, 101. TROCADERO (Barr, Morse).—Description as No. 142.

97. IMPROVED BIG BOSTON (Thorburn).—Description as No. 142.

102. BIG BOSTON (Morse).—Description as No. 142.

103, 104. IDEAL (Barr, * Sutton).—Description as No. 142.

94. GRAND ADMIRAL (R. Veitch).—Germination poor. Leaves shaded as well as margined reddish brown. Flavour mild. Late in maturing.

270. VICTORIA RED (Barr *).—Germination poor. Leaves somewhat blistered, tinged and margined reddish brown ; heads firm, of fair quality, bitter and tender. Ready June 18. Did not stand long.

66, 128. EXETER WINTER GIANT (R. Veitch).—See Winter Lettuces (p. 354). Bolted when sown in summer.

* This sender does not yet list this variety.

67. **EARLY RED SPOTTED** (Barr).—Compact; foliage dark greenish brown, all leaves being much spotted with small reddish-brown spots; heads firm, of good quality, mild and tender. Ready July 1, and did not stand as long as 'Continuity,' *q.v.*

(c) Large.

109. **BOURCHARLAT** (Barr*).—Compact; foliage dark green tinged dull brown, spotted with brown, greyish green below; hearts firm, of good quality, bitter, tender. Ready July 6. Very slow to bolt.

72. **HARDY RED WINTER** (Barr).—Fit only for winter sowing. See Trial Winter Lettuces (p. 354).

2. Foliage not tinged brown or red.

(a) Medium dark green, but margins yellow.

116. **ALL SEASONS** (Barr*).—Medium large, compact; foliage somewhat blistered and crumpled; heads firm, of fair quality, bitter and tender. Ready June 26. Stood well. Distinct from 'All Seasons' of American growers.

(b) Foliage medium green, leaf margins yellow.

Medium large.

98. **SANS RIVALE** (Barr*)

99, 262, 278. **UNRIVALLED** (Morse, Nutting, Cooling) }—Compact. Similar to No. 116, but a little paler. Ready June 19. Standing medium well, but bolting irregularly.

87. **MARKET FAVOURITE** (Watkins & Simpson), A.M. June 13, 1919.—Very compact; foliage somewhat blistered and crumpled; hearts firm, of good quality, mild and tender. Ready June 16. Stood fairly well, but bolted rather irregularly.

129, 130. **HEARTWELL** (Sutton, Barr), A.M. June 23, 1919.—Very compact; foliage somewhat blistered and crumpled; hearts firm, of good quality, bitter, tender. Ready June 19. Slow to bolt.

61, 62. **MCHATTIE'S GIANT** (Kent & Brydon, Barr).—Fit only for winter sowing. See Report on Winter Lettuces (p. 354).

(c) Foliage medium dark green.

(1) Medium large.

138. **SUMMER QUEEN** (Barr*).—Compact; foliage slightly blistered and crumpled; hearts firm, of good quality, somewhat bitter, tender. Ready July 6. Very slow to run.

143. **PARAGON** (Barr).—Very similar to No. 138. Leaves grey-green below and flavour mild. Ready July 8.

139, 140, 141. **DEACON** (Morse, Thorburn, Burpee), also called **SAN FRANCISCO MARKET** (Burpee).—Description as No. 138, but slightly darker.

144. **VAUXHALL DEFIANCE** (Watkins & Simpson).—Grayer and darker green than No. 143. Ready July 8. Stood well.

145. **PIONEER** (A. Dickson).—Foliage rather more blistered than No. 141 and of a glossy brighter green. Ready July 8. Shot to seed irregularly.

110. **WHITE FAVOURITE** (Barr).—Compact; foliage slightly blistered; head firm, rather pale at top, of good quality, mild and tender. Ready June 28. Slow to bolt.

117. **WHITE CHAVIGNÉ** (Dawkins).—Similar to No. 110, but rather glossier. Somewhat later in maturing and very slow to bolt.

125. **HAMMERSMITH HARDY WINTER GREEN** (Barr*)

127. **YATES' WINTER** (Barr*) }—Fit only for winter sowing. See Report on Winter Lettuces (p. 354).

* This sender does not yet list this variety.

(2) Medium size.

132, 133. HUBBARD'S MARKET (Thorburn, Morse).—Compact; foliage almost smooth; hearts firm, of good quality, bitter and fairly tender. Ready June 16, but soon shot to seed.

134. WHITE SUMMER CABBAGE (Thorburn).—Said to be smaller than foregoing, but in our cultures indistinguishable.

118, 119, 120. WAYAHEAD (Thorburn, Morse, Burpee), called EARLIEST WAYAHEAD by Burpee.—Compact; foliage somewhat blistered; heads firm, of good quality, bitter and tender. Ready June 15. Did not stand long.

121. WAYAHEAD (Barr *), A.M. June 13, 1919.—A very even stock.

137. QUEEN OF SUMMER (Barr *).—Compact; foliage but slightly blistered; hearts firm, flavour mild, of good quality, tender. Ready July 7. Stood well.

(d) Foliage medium green.

(1) Large.

146. NEW SUMMER (Dawkins).—Very large, compact; foliage somewhat blistered and crumpled; heads firm, of good quality, mild and tender. Ready July 6. Slow to run to seed.

151. EXHIBITION GIANT (Barr *).—Large, compact; foliage blistered and crumpled; heads firm, of good quality, somewhat bitter, tender. Ready June 30. Stood well.

(2) Medium large.

191. STANDWELL (Sutton) } A.M. June 23, 1919.—Compact; foliage somewhat blistered and crumpled; heads firm, of good quality, bitter, tender. Ready June 24. Slow to run to seed.

113. MAMMOTH GREEN (Barr *).—Bolted very quickly.

(3) Of medium size.

179. COVENT GARDEN SUMMER WHITE (Barr).—Compact; foliage slightly blistered and crumpled; hearts firm, of good quality, mild, and somewhat crisp, tender. Ready June 27. Slow to bolt.

131. NANSEN (Barr *).—Compact; foliage similar to No. 179; hearts rather lighter, firm, of fair quality, not very tender. Ready June 19. Did not stand long.

165. MONUMENT (A. Dickson).—Compact; foliage blistered; hearts firm, of fair quality, mild and tender. Ready July 1. Very slow to bolt.

122. COVENT GARDEN WINTER WHITE (Barr).—Fit only for autumn sowing. See Winter Lettuces (p. 354).

135. SCHOFIELD'S HARDY WINTER (Barr).—Fit only for autumn sowing. See Winter Lettuces (p. 354).

174. EARLY PARIS CUTTING (Barr *).—Bolted without hearting.

176. EARLY PARIS MARKET FORCING (Barr).—Bolted very quickly.

(4) Small medium.

279. FORCING MILLY (Cooling).—Compact; foliage blistered somewhat; heads firm, of fair quality, bitter and tender. Ready July 7. Slow to run.

277. PHILADELPHIA EARLY WHITE (Barr *).—Compact; foliage more or less crumpled and blistered; heads firm, but not standing long; tender, bitter, quality fair.

* This sender does not yet list this variety.

(5) Small.

183. EARLIEST OF ALL (Barr *).—Ran to seed without hearting.

(e) Foliage light green.

(1) Of medium size.

252. PEERLESS (Barr *).—Sent as a Cos Lettuce.

(2) Small medium.

166. LITTLE GEM (Barr).—Compact; foliage slightly blistered; heads firm, of fair quality, bitter and tender. Ready June 18. Did not stand long.

(3) Small.

167. WHITE TENNISBALL (Barr *).—Compact; foliage slightly blistered and crumpled; heads firm, of fair quality, bitter, tender. Ready June 16. Bolted very quickly.

(f) Foliage light yellowish green, plant small.

171. GOLDEN BALL (Sutton).—Compact; foliage slightly blistered; hearts firm, of fair quality, bitter and tender. Ready June 22. Did not stand long.

172, 266. GOLDEN QUEEN (Thorburn, Nutting).—Description as No. 171.

181. BUTTERCUP (Barr *).—Indistinguishable from foregoing.

184. LEMON QUEEN (Dobbie).—Description as No. 171.

b. Seeds yellow.

1. Medium dark green, margins tinged brown.

64. GIANT SUMMER BROWN (Barr *).—Large, compact; foliage somewhat blistered; hearts firm, of good quality, mild, sweet, and tender. Ready June 28. Stood well.

2. Medium green, margins of leaves paler.

112. YELLOW-SEEDED BUTTER (Morse). A.M. June 23, 1919.—Medium large, compact; foliage somewhat blistered and crumpled; hearts firm, of good quality, mild, but rather coarse in texture. Ready June 26. Slow but not quite regular in running to seed.

3. Medium dull green.

147. MAGNUM BONUM (Barr).—Bolted without hearting.

c. Black-seeded.

1. Foliage more or less coloured brown or red.

(a) Large.

86. AUTUMN QUEEN (Barr *).—Compact; foliage dark dull green-brown, margins reddish brown; more or less blistered; hearts firm, of good quality, somewhat bitter, crisp and tender. Ready June 18. Stood well.

80. MAXIMUM (Thorburn).—Compact; foliage medium dark green with brown margins and spots; blistered, of good quality, bitter, crisp and tender. Ready June 17. Slow to run.

81. GIANT (Sutton).—Similar to last, but of deeper shade than No. 80, later, and very slow to run.

95, 96. BLACK-SEEDED BIG BOSTON (Morse, Burpee).—Compact; medium dull green, margins tinged reddish brown; leaves slightly blistered; hearts firm, of good quality, bitter and tender. Ready June 19. Slow to run.

* This sender does not yet list this variety.

71. CONTINUITY (Barr) } —Rather spreading; dark dull reddish brown,
63. THE MOOR (Barr *) }
inner leaves showing some green; leaves blistered and crumpled; head firm,
of fair quality, very bitter, crisp and rather coarse in texture. Ready June 25.
Ran to seed rather rapidly. Quite distinct from 'Continuity' of most senders
(see below).

(b) Size medium.

75. BROWN DUTCH (Morse).—Dull greenish brown with pale brown margins;
compact; foliage blistered and crumpled; heads rather soft, of good quality,
bitter and tender. Ready June 18. Very slow to run.

74. PERCHERONNE (Barr*), A.M. June 23, 1919.—Compact; like No. 75; but
margins of leaves deeper tinted and heads firm. Ready June 18. Very slow
to run.

73. RELIANCE (Barr).—Darker and more glossy than No. 74, and leaf margins
only slightly shaded red; otherwise very similar. Ready June 16. Slow to run.

78. NAUMBERGER or TENDERHEART (Burpee).—Medium dull green, margins
brown, and foliage spotted brown; more or less blistered; heads firm, of good
quality, rather bitter and tender. Ready June 27. Very slow to run.

90, 91, 92. CALIFORNIA CREAM BUTTER (Thorburn, Morse, Burpee), A.M.
June 23, 1919.—Medium dull green, margins tinged reddish brown and leaves
spotted brown; somewhat blistered; heads firm and hard, of good quality,
rather bitter, tender. Ready June 16. Slow to run.

68, 69, 70, 267. CONTINUITY (Carter, Veitch, Morse, Nutting), A.M. June 13,
1919.—Compact; dark dull brown on a green ground, margins deeper; leaves
more or less blistered; heads very firm, of excellent quality, slightly bitter,
tender. Ready June 16. Very slow to run.

[Note.—Two strains of 'Continuity' are commonly sold (see No. 71 above).
The one here described is that introduced by Messrs. Daniels in 1884 and is
a more compact lettuce, standing long before running to seed.]

76. SATISFACTION (Sutton), A.M. June 13, 1919.—Description as foregoing.

268. WINTER BEAUTY (Barr).—Runs very quickly.

2. Foliage wholly green.

(a) Large.

114, 115. ALL SEASONS (Morse, Burpee).—Compact; leaves slightly blistered,
dark dull green; hearts fairly firm, of good quality, mild, but texture rather
coarse. Ready July 6. Slow to run. Stocks not quite true.

(b) Medium large.

(1) Dark dull green.

169. GREEN FAVOURITE (Barr).—Compact; leaves somewhat blistered
and crumpled; hearts firm, of good quality, mild and tender. Ready July 1.
Plants irregular in running to seed.

(2) Medium dark green.

152. IMPROVED SALAMANDER (Thorburn) } —Compact; foliage slightly blis-

153. SALAMANDER (Morse) }
tered and crumpled; heads firm, of good quality, rather bitter, tender. Ready
June 26. Slow to run.

154. EXHIBITION CABBAGE (Dobbie).—Description as Nos. 152, 153.

148. BRITTANY WINTER WHITE (Barr).—Not suitable for summer sowing.
See Report on Winter Lettuces (p. 354).

* This sender does not yet list this variety.

(3) Medium dull green.

123. **GLORIOSA** (Barr *), **A.M.** June 23, 1919.—Compact; foliage blistered and crumpled; heads firm, of good quality, bitter, tender. Ready June 19. Slow to run. Stock very even.

(c) Medium size.

159. **EARLY MARKET ALL HEART** (Watkins & Simpson).—Compact; foliage only slightly blistered, medium dull green; heads firm, of good quality, mild and tender. Ready June 26. Slow to run. Somewhat darker green than Nos. 155 to 158.

(d) Small.

177. **EARLY PARIS** (Sutton).—Ran to seed without hearting.

3. Green, but margins of leaves paler.

(a) Large or very large.

(1) Dark dull green.

180. **MARVEL OF CAZARD** (Barr *), **H.C.** June 23, 1919.—Compact; leaves blistered and crumpled; hearts firm, of good quality, mild and tender. Ready June 26. Very slow to run. A true stock.

(2) Medium green.

149, 150. **MAMMOTH BLACK-SEEDED BUTTER** (Thorburn, Morse).—Very large, compact; leaves blistered and crumpled; hearts firm, of fair quality, bitter and tender. Ready June 30. Slow to run.

163. **BEAUTY OF LILLE** (Barr *).—Large, compact; foliage almost smooth; heads firm, of good quality, mild, sweet, and tender. Ready June 25. Slow but irregular in running. Similar to No. 165, but margins of leaves paler.

(b) Medium large.

(1) Medium dark green.

271. **EARLY LONG KEEPER** (Barr *).—Compact; foliage blistered and crumpled; hearts firm, of fair quality, tender but very bitter. Ready June 18. Slow to run.

(2) Medium dull green.

150, 204. **ALL THE YEAR ROUND** (Sutton, Nutting), **A.M.** June 13, 1919.—Compact; foliage somewhat blistered and crumpled; heads firm, of good quality, mild and tender. Ready June 13. Slow to run. Stock very even.

155. **ALL THE YEAR ROUND, RE-SELECTED** (Carter).—Description as foregoing, but later.

157, 158. **ALL THE YEAR ROUND** (Barr, Morse).—Description as No. 155.

160, 161. **MATCHLESS** (Sutton, Barr *)

162. **ROUND-LEAVED** (Barr *)

164. **CRITERION** (Webb)

} **H.C.** June 23, 1919.—Compact; foliage slightly blistered; heads firm, of good quality, mild and tender. Ready June 26 (No. 162 a little earlier). Very slow to run.

(c) Medium size.

186. **TOM THUMB, ORDINARY STOCK** (Sutton).—Compact; leaves blistered and crumpled, medium dull green; heads firm, of fair quality, mild but rather coarse in texture. Ready June 26. Slow to run. Distinct from 'Wheeler's Tom Thumb' (see below).

126. **WINTER GREEN** (Barr).—Ran to seed without hearting.

136. **WHITE MADEIRA** (Barr).—Suitable only for winter sowing. See Report on Winter Lettuces (p. 354).

* This sender does not yet list this variety.

(d) Small.

(1) Medium dark dull green.

189. **COMMODORE NUTT** (Sutton), **H.C.** June 13, 1919.—Compact; foliage blistered and crumpled; hearts firm, of good quality, mild in flavour, but rather coarse in texture. Ready June 11, but inclined to run to seed rather quickly when mature.

(2) Medium dull green.

185. **WHEELER'S TOM THUMB** (Morse)
 187. **TOM THUMB, BARR'S SELECTED** (Barr)
 188. **TOM THUMB IMPROVED** (Sutton)
 190, 265. **TOM THUMB** (Simpson, Nutting) } —Compact; foliage blistered and crumpled, heads firm, of fair quality, mild and tender. Ready June 13, Very slow to run.

C. Semi-Cos Varieties.

The varieties we have grouped here are compact growing forms of a glossy dark green colour and having characters more or less intermediate between the Cabbage forms with tender leaves and the Cos with crisp leaves and wide midribs. They make good hard close hearts, which are usually taller than their width, unlike the Cabbage forms, where they are about as wide as high. The leaves are thick. They require comparatively little space since their outer leaves are more or less erect. They stand well without running to seed.

I. SEEDS BLACK.

84. **MADRID GREEN** (Barr *)—Sown April 4. Ready June 20.
 111. **MADRILENE** (Barr *)—Rather larger than No. 84. Sown April 4. Ready June 30.

II. SEEDS WHITE.

192, 193, 194. **LITTLE GEM** (Dawkins, Barr, * Sutton)—Sown May 5. Ready July 12.

258. **NONSUCH** (Sutton)—The largest of this type. Sown May 5. Ready July 14.

230. **WINTER DENSITY** (Toogood), **A.M.** July 17, 1919.—Somewhat smaller than No. 258, but otherwise similar and an excellent stock. Sown May 5. Ready July 12.

D. Cos Varieties.

The Cos varieties are probably more grown as summer lettuces than any others. Their crisp leaves recommend them to many to whom the more buttery texture of the Cabbage varieties is less pleasing. So many self-hearting varieties are now available that for summer use at least those that require tying may generally be neglected. It is a curious fact, however, that even varieties that are self-hearting find a more ready sale when they have a tie of raffia around them than when this is omitted. The main variations are seen in colour, size, and to a certain extent in time of coming to maturity. These varieties were sown on May 5.

I. WHITE-SEEDED, FOLIAGE NOT TINGED RED OR BROWN.*a. Dark dull green.***1. Large, self-hearting.**

208. **ALL HEART** (Barr *)
 209. **WHITE HEART** (Sutton) } **H.C.** July 17, 1919.—Compact; leaves of medium thickness; hearts firm, of good quality. Ready July 19. Ran to seed quickly.

211. **LOBJOIT'S GREEN Cos** (Watkins & Simpson), **H.C.** July 17, 1919.—Very similar to Nos. 208, 209. Stock a little more regular.

215. **EMERALD QUEEN** (Barr), **H.C.** July 17, 1919.

* This sender does not yet list this variety.

2. Large but dwarf, self-hearting.

195, 196. DWARF PERFECTION (Barr, Sutton), H.C. July 17, 1919.—Very compact; leaves thick, paler at margins; hearts hard, of excellent quality. Ready July 20. Stands fairly well.

213. EXPRESS COS (Morse).—Similar to 'Dwarf Perfection,' but a poor stock.

214. EXPRESS OR ECLIPSE (Burpee).—Failed to germinate.

b. Medium dark green.

1. Very large, self-hearting.

220, 221. GIANT WHITE (Carter, Morse).—Compact; leaves of medium thickness; hearts fairly firm, of fair quality and mild flavour. Ready July 22. Did not stand long. No. 221 was a very irregular stock.

231. MONSTROUS WHITE (Webb), H.C. July 17, 1919.—Compact; leaves thick; hearts hard, of good quality. Ready July 21. Did not stand long.

2. Medium large.

225. EARLY FRENCH MARKET (Barr *).—Compact; leaves thick, slightly tinged brown at margin; hearts hard, of fair quality, sweet and crisp. Ready July 22. Did not stand.

216. GREEN PROVENCE (Barr).—Compact; leaves of medium thickness; hearts hard, of good quality. Ready July 19. Bolted quickly.

247. COVENT GARDEN WINTER WHITE (Barr) }

235. EARLY FRAME (Barr) }

236. BEAUTY OF VERSAILLES (Barr *) }

A.M. July 17, 1919.—Compact; leaves of medium thickness; hearts firm, of fair quality. Ready July 19. Stood fairly.

c. Medium green.

1. Large.

245. DAVIES' HARDY GREEN (Cooper-Taber).—Fairly compact; leaves of medium thickness, toothed at margin; hearts firm, of fair quality. Ready July 19. Did not stand long.

251. CHESNAY LARGE WHITE (Barr *).—Compact; leaves of medium thickness, crenate at margin; hearts firm, of fair quality. Ready July 19. Stood fairly well.

250. COVENT GARDEN SUMMER WHITE (Barr) }
249. WHITE PARIS (Morse) } .—Similar to No. 251.

234. SUPERB WHITE (Sutton).—Related to foregoing, but foliage thick; hearts hard, of good quality. Stood fairly well. A good stock.

233. SHARPE'S STANDARD WHITE (Barr *).—Description as No. 234.

238, 239, 240. TRIANON (Morse, Barr, Thorburn).—Compact; leaves of medium thickness; hearts firm, of good quality. Ready July 19. Standing fairly well. No. 238 was the best stock.

237. ALEXANDRA (Barr *), H.C. July 17, 1919.—Description as Nos. 238 to 240. A good stock ready July 19, and standing well. The variety generally grown under this name is darker than 'Trianon.'

243. SUMMER WHITE (Simpson).—Description as Nos. 238 to 240.

253. PEERLESS (Sutton).—Compact; leaves of medium thickness; hearts firm, of fair quality. Ready July 17. One of the earliest Cos varieties. Stood fairly well.

217. ST. ALBANS ALL HEART (Harrison), A.M. July 17, 1919.—Compact; leaves thick; hearts firm, of good quality. Ready July 19. Stood well.

224. SUPERIOR HARDY WHITE (Harrison).—Rather spreading; leaves of medium thickness; hearts firm, of fair quality, mild. Ready July 21; did not stand long.

* This sender does not yet list this variety.

2. Medium large, self-hearting.

254. DWARF WHITE HEART (Burpee), A.M. July 17, 1919.—Compact, grey-green; leaves of medium thickness; hearts firm, of good quality. Ready July 19. Stood fairly well.

275. DWARF WHITE HEART (Barr).—Like No. 254.

232. MOOR PARK (Barr).—Fairly compact; leaves thick; hearts firm, of fair quality. Ready July 21, but soon running.

3. Medium size, self-hearting.

242. WHITE COS (Sutton).—Compact; leaves thick; hearts firm, of fair quality. Ready July 19, but not standing long.

241. LONDON WHITE (Barr).—Description as No. 242.

4. Medium size, need tying.

222. HICKS' HARDY WHITE WINTER (Morse) } —Somewhat spreading; leaves

223. HARDY WHITE (Nutting) } of medium thickness; hearts rather soft, of fair quality, rather bitter. Ready July 21. Did not stand long.

d. Light medium green.

1. Very large, self-hearting.

218, 219. JUMBO (Carter, Barr).—Rather spreading; leaves of medium thickness; hearts fairly firm, of fair quality. Ready July 22; did not stand long.

2. Large, self-hearting.

246, 248. WINTER WHITE (Webb, Sutton), H.C. July 17, 1919.—Compact; leaves of medium thickness; hearts firm, of good quality. Ready July 19. Stood well.

3. Medium-large, self-hearting.

226. KINGSHOLM (Morse).—A poor stock of a lettuce similar to the next.

227. GIANT WHITE (Barr), H.C. July 17, 1919.—Compact; leaves thick; hearts very firm, of good quality, slightly bitter. Ready July 19. Stood well.

II. BLACK-SEEDED.

a. Foliage tinged or coloured brown or red.

1. Self-hearting.

205. WALKER'S SUGARLOAF (Barr).—Stock mixed with 'Brown Bath Cos.' A dwarf greenish brown lettuce, soon bolting.

206. SOLID BROWN (Daniels).—Rather spreading; leaves thick, dull greenish brown with reddish margins; hearts firm, of good quality, medium large, sweet. Ready July 19. Stood fairly well.

2. Need tying.

(a) Large.

197. WINTER RED (Barr).—Did not heart readily. Some bolted. An irregular stock.

198. BLOOD-RED WINTER (Barr).—Very similar to No. 197.

199, 201. BLACK-SEEDED BATH COS (Morse, Thorburn) }

200. GIANT BATH COS (Barr) }

204. COVENT GARDEN WINTER BROWN (Barr) }

274. LEVIATHAN (Cooling) }

—Medium dull green

with reddish brown tinge; rather spreading; leaves thick; hearts firm, of good quality. Ready July 24. Slow but irregular in bolting.

202. BLACK-SEEDED BATH (Sutton).—Later than foregoing, and of a somewhat different tinge.

(b) Medium large.

203. CHAMPION BROWN (Sutton).—A greener form than 'Black-seeded Bath,' and somewhat smaller; leaves thin; forms a soft loose heart, of fair quality. Late in hearting.

b. Foliage not tinged red or brown, self-hearting.

207. THE BARNUM (Barr)

228. MAMMOTH COS (R. Veitch)

255, 256, 257. BALLOON (Thorburn, Sydenham, Barr) } A.M. July 17, 1919.—

259. EXHIBITION COS (Webb)

Very large, rather spreading; leaves medium green, of medium thickness; hearts hard, of good quality, very crisp. Ready July 21. Slow to bolt.

229. MAMMOTH WHITE (Sutton).—Similar to foregoing, but running more quickly.

212. DREADNOUGHT (Barr).—Similar to foregoing, but a less regular stock.

WINTER LETTUCES AT WISLEY, 1917-18.

ONE hundred and fifteen samples of lettuce seeds were sown on September 8, 1917, and transplanted on ground from which an early crop of potatoes had been lifted, and which had afterwards been dug on October 10. The rows were 15 inches apart, and 12 inches was allowed between the plants. A few plants died, and their places were filled on November 10, after which no planting was done. The winter was very severe, as reference to the report on weather at Wisley in 1917-18 will show, and gave a very severe test of the hardiness of the different forms. A note will be found following each name in the "Notes and Descriptions" showing proportion of survivors.

The Judging Committee examined the trials on May 16, and made the following recommendations for Awards:—

Award of Merit.

4. Brittany Winter White, sent by Messrs. Barr.
55. Stanstead Park, sent by Messrs. Nutting.

Highly Commended.

38. Commodore Nutt, sent by Messrs. Sutton.
34. Immense Hardy Green, sent by Messrs. Webb.
- 12, 13, 14. Tom Thumb, re-selected, sent by Messrs. Carter, Barr, Sydenham.
3. Tremont Winter, sent by Messrs. Barr.
1. White Madeira, sent by Messrs. Barr.
60. Wonderful, sent by Messrs. Webb.
30. Yates' Winter, sent by Messrs. Barr.

Commended.

20. McHattie's Giant, sent by Messrs. Kent and Brydon.
28. Schofield's Hardy Winter, sent by Messrs. Barr.

VARIETIES.*

- | | |
|--|--|
| 1. White Madeira, B. II. c. 3 (c) (1). | 10. Hammersmith Hardy Green, B. II. a. 2 (c) (1). |
| 2. Madeira Large White, B. II. a. 1 (a). | 11. Golden Ball, B. II. a. 2 (e) (2). |
| 3. Tremont Winter, B. II. a. 1 (a). | 12. Tom Thumb, re-selected, B. II. c. 3 (d) (2). |
| 4. Brittany White Winter, B. II. c. 2 (b) (2). | 13. Tom Thumb, extra selected, B. II. c. 3 (d) (2). |
| 5. Little Gem, B. II. a. 2 (e) (2). | 14. Tom Thumb, B. II. c. 3 (d) (2). |
| 6. Lemon Queen, B. II. a. 2 (f). | 15. Round-leaved, B. II. c. 3 (b) (2). |
| 7. Hammersmith, B. II. a. 2 (c) (1). | 16. Covent Garden Winter White, B. II. a. 2 (d) (3). |
| 8. Hammersmith Hardy Green, B. II. a. 2 (c) (1). | 17. Golden Ball, B. II. a. 2 (e) (2). |
| 9. Hammersmith Hardy Green, B. II. a. 2 (c) (1). | 18. McHattie's Giant |
| | 19. " " } B. II. a. 2 (b). |
| | 20. " " } |

* See footnote, p. 120.

21. White Chavigné, B. II. *a. 2* (c) (1).
 22. All the Year Round
 23. " " } B. II. *c.*
 24. " " } 3 (b) (2).
 25. " " }
 26. " " }
 27. " " }
 28. Schofield's Hardy Winter, B. II. *a. 2* (d) (3).
 29. Market Favourite, B. II. *a. 2* (b).
 30. Yates' Winter, B. II. *a. 2* (c) (1).
 31. Lee's Immense Hardy Green, B. II. *a. 2* (c) (1).
 32. Lee's Immense Hardy Green, B. II. *a. 2* (c) (1).
 33. Lee's Immense, B. II. *a. 2* (c) 1.
 34. Immense Hardy Green, B. II. *a. 2* (c) (1).
 35. Giant, B. II. *c. 1* (a).
 36. Improved Drumhead, B. I. *a. 7*.
 37. Drumhead or Malta, B. I. *a. 5*.
 38. Commodore Nutt, B. II. *c. 3* (d) (1).
 39. Ar, B. I. *a. 3*.
 40. Standwell } B. II. *a. 2* (d) (2).
 41. " " }
 42. Matchless, B. II. *c. 3* (b) (2).
 43. Heartwell, B. II. *a. 2* (b).
 44. May King, B. II. *a. 1* (a).
 45. Early Paris Market, B. II. *a. 1* (a).
 46. Early Paris Market, B. II. *a. 1* (a).
 47. Exhibition, B. II. *c. 2* (b) (2).
 48. Grand Admiral } B. II. *a. 1* (b).
 49. " " }
 50. " " }
 51. Exeter Winter Giant, B. II. *a. 1* (b).
 52. Stanstead Park } B. II. *a. 1* (a).
 53. " " }
 54. " " }
 55. " " }
 56. " " }
 57. Favourite } B. I. *a. 6*.
 58. " " }
 59. Harbinger Forcing, B. I. *a. 8*.
 60. Wonderful, B. I. *a. 3*.
 61. Trocadero, B. II. *a. 1* (b).
 62. Trocadero or Lorthois, B. II. *a. 1* (b).
 63. Hardy Red Winter, B. II. *a. 1* (c).
 64. Reliance, B. II. *c. 1* (b).
 65. Supreme, B. I. *a. 2*.
 66. Ideal, B. II. *a. 1* (b).
 67. Paragon, B. II. *a. 1* (b).
 68. Herniman's Hardy, B. II. *a. 1* (b).
 69. Continuity, B. II. *c. 1* (a).
 70. Continuity } B. II. *c. 1* (b).
 71. " " }
 72. Satisfaction, B. II. *c. 1* (b).
 73. Little Gem or Sucrine, C. II.
 74. Little Gem } C. II.
 75. " " }
 76. Dwarf Perfection, D. I. *a. 2*.
 77. Winter Density, C. II.
 78. St. Albans All Heart, D. I. *c. 1*.
 79. White Heart, D. I. *a. 1*.
 80. Bath Cos, D. II. *a. 2* (a).
 81. Bath Cos, Giant Black-seeded, D. II. *a. 2* (a).
 82. Brown or Bath Cos, D. II. *a. 2* (a).
 83. Black-seeded Bath, D. II. *a. 2* (a).
 84. Covent Garden Winter Brown, D. II. *a. 2* (a).
 85. Champion Brown, D. II. *a. 2* (b).
 86. Bath Cos } D. II. *a. 2* (a).
 87. " " }
 88. Walker's Sugarloaf, D. II. *a. 1*.
 89. Solid Brown, D. II. *a. 1*.
 90. Monstrous White, D. I. *b. 1*.
 91. Ideal, D. I. *c. 2*.
 92. Moor Park, D. I. *c. 2*.
 93. The Barnum, D. II. *b.*
 94. White Heart, D. I. *a. 1*.
 95. Mammoth White, D. II. *b.*
 96. Superb White, D. I. *c. 1*.
 97. Winter White, D. I. *d. 1*.
 98. Peerless, D. I. *c. 1*.
 99. Nonsuch, C. II.
 100. Davies' Hardy Green, D. I. *c. 1*.
 101. Winter White, D. I. *d. 1*.
 102. Hardy Winter White, D. I. *c.*
 103. Hardy White, D. I. *c. 4*.
 104. Covent Garden Winter White, D. I. *b. 2*.
 105. Hicks' Hardy Winter White, D. I. *c. 4*.
 106. Hicks' Hardy White } D. I. *c. 4*.
 107. " " }
 108. Balloon, D. II. *b.*
 109. Green Royal Winter (failed).
 110. All Seasons, D. II. *a. 2* (c).
 111. Blood-red Winter, D. II. *a. 2* (a).
 112. Green Winter, B. II. *a. 2* (c) (1).
 113. Superior Hardy White, D. I. *c. 1*.
 114. Stanstead Park, B. II. *a. 1* (a).
 115. Hicks' Hardy White, D. I. *c.*
 116. McHattie's Giant, B. II. *a. 2* (b).

NOTES AND DESCRIPTIONS.

In the following notes the same system of classification has been followed as for the Summer Lettuce Trial (see p. 334), and the section numbering is the same as given there. Where they occur in the Summer Lettuce Trial, and descriptions are given in that report, reference back is made.

B. Cabbage Hearting Lettuce (p. 342).

I. CRISP HEARTING.

a. Seeds white.

2. Foliage medium green, margins red.

65. SUPREME (Sutton).—See p. 342. 60 per cent. survived, but did not make good plants.

3. Foliage dark dull green, margins paler.

60. WONDERFUL (Webb), **H.C.** May 16, 1918.—See p. 342. 70 per cent. survived. Ready May 10.

39. AI (Sutton).—See p. 342. 55 per cent. survived.

5. Foliage medium dull green.

37. DRUMHEAD OF MALTA (Dawkins).—See p. 343. 45 per cent. survived.

6. Foliage light medium green, margins paler.

57, 58. FAVOURITE (Sutton, Barr).—See p. 343. 60 per cent. survived.

7. Foliage light medium dull green.

36. IMPROVED DRUMHEAD (Sutton).—See p. 343. 30 per cent. survived.

8. Foliage light green.

59. HARBINGER FORCING (Barr).—See p. 343. 50 per cent. survived.

II. SMOOTH HEADING OF BUTTERY TEXTURE.

a. Seeds white.

1. Foliage medium green, tinged more or less red.

(a) Medium size.

45, 46. EARLY PARIS MARKET (Nutting, Dobbie).—See p. 344. 50 per cent. survived.

44. MAY KING (Dobbie).—See p. 344. 10 per cent. survived.

3. TREMONT WINTER (Barr), **H.C.** May 16, 1918.—Plant compact, with a firm, round, somewhat flattened head. Outer leaves somewhat blistered, and blotched reddish brown. Ready May 9. 90 per cent. survived.

2. MADEIRA LARGE WINTER (Barr).—Plant spreading, with a loose head, rather open at top. Outer leaves blistered and somewhat blotched. All survived. Ready May 4, but germination poor.

52, 53, 54, 55, 56, 114. STANSTEAD PARK (Dobbie, Hurst, Barr, Nutting, Dawkins, Harrison), No. 55, **A.M.**, the best stock.—Plant rather spreading, with a bluntly ovate, fairly firm head; leaves somewhat crumpled towards base and heart, spotted brown. Ready May 7. All survived.

(b) Medium large.

67. PARAGON (Webb).—See p. 344. 80 per cent. survived.

61, 62. TROCADERO (Barr, Dawkins).—See p. 344. 80 per cent. survived.

66. IDEAL (Sutton).—See p. 344. 80 per cent. survived.

48, 49, 50. GRAND ADMIRAL (R. Veitch, Barr, Nutting).—Plants rather spreading, with a bluntly conical, firm head; leaves flat at margin, surface crumpled. Ready May 21. 30 per cent. survived.

51. EXETER WINTER GIANT (R. Veitch).—Plant spreading, with fairly firm head; yellow green, and outer leaves spotted brown. Ready May 7. 80 per cent. survived.

68. **HERNIMAN'S HARDY** (Cooper-Taber).—Plant fairly compact, heart only fair; foliage yellow green with margin tinged. Ready May 31. Few survived; germination bad.

(c) Large.

63. **HARDY RED WINTER** (Barr).—Compact, with a semi-conical head, fairly firm, but more or less open at top; greenish-brown foliage. Ready May 16. All survived.

2. Foliage not tinged.

(b) Foliage medium green, leaf margins yellower.

29. **MARKET FAVOURITE** (Barr).—See p. 345. 50 per cent. survived.

43. **HEARTWELL** (Sutton).—See p. 345. 55 per cent. survived.

18, 19, 20, 116. **McHATTIE'S GIANT** (Barr, Dobbie, Kent & Brydon, Harrison), No. 20, **C.** May 16, 1918.—Plant somewhat spreading, with a hard heart; leaves blistered. Ready May 16. 80 per cent. survived.

(c) Foliage medium dark green.

(1) Medium large.

21. **WHITE CHAVIGNÉ** (Dawkins).—See p. 345. 50 per cent. survived.

7. **HAMMERSMITH** (Carter)

8, 9, 10. **HAMMERSMITH HARDY GREEN** (Barr, Nutting, R. Veitch)

30. **YATES' WINTER** (Barr)

31, 32. **LEE'S IMMENSE HARDY GREEN** (Barr, Nutting)

33. **LEE'S IMMENSE** (Hurst)

34. **IMMENSE HARDY GREEN** (Webb)

compact, with a firm, flat round head. Ready May 10. 90 per cent. survived. These are all forms nearly related, but the stocks differed considerably, the truest being No. 30, **H.C.**, and No. 34, **H.C.** May 16, 1918.

112. **GREEN WINTER** (Harrison).—Nearly related to foregoing. 80 per cent. survived.

(d) Foliage medium green.

(2) Medium large.

40, 41. **STANDWELL** (Sutton, Barr).—See p. 346. 40 per cent. survived.

(3) Of medium size.

16. **COVENT GARDEN WINTER WHITE** (Barr).—Rather spreading in habit, with a firm round heart 5 to 6 inches across; foliage rather crumpled. Ready May 17. 60 per cent. survived.

28. **SCHOFIELD'S HARDY WINTER** (Barr), **C.** May 16, 1918.—Plant rather spreading, with a flattish round head; firm. Ready May 16. 80 per cent. survived.

(e) Foliage light green.

(2) Small medium.

5. **LITTLE GEM** (Barr).—See p. 347. 30 per cent. survived.

(f) Foliage light yellowish green, plant small.

11, 17. **GOLDEN BALL** (Barr, Sutton).—See p. 347. 35 per cent. survived.

6. **LEMON QUEEN** (Dobbie).—See p. 347. 40 per cent. survived.

c. *Black-seeded.*

1. Foliage more or less coloured brown.

(a) Large.

35. **GIANT** (Sutton).—See p. 347. 70 per cent. survived.

69. **CONTINUITY** (R. Veitch).—See p. 348 (No. 71 in Summer trial). 60 per cent. survived.

(b) Medium size.

64. RELIANCE (Barr).—See p. 348. 75 per cent. survived.

70, 71. CONTINUITY (Dobbie, Daniels) } —See p. 348. 60 per cent. survived.
72. SATISFACTION (Sutton).

2. Foliage wholly green.

(b) Medium large.

(2) Medium dark green.

47. EXHIBITION (Dobbie).—See p. 348. 70 per cent. survived.

4. BRITTANY WHITE WINTER (Barr), **A.M.** May 16, 1918.—Plant compact, with a round rather flattened solid heart; leaf margins regular. Ready May 9. 70 per cent. survived.

3. Green, but with margins of leaves paler.

(b) Medium large.

(2) Medium dull green.

22, 23, 24, 25, 26, 27. ALL THE YEAR ROUND (R. Veitch, Dawkins, Sydenham, Carter, Barr, Hurst).—See p. 349. 70 per cent. survived.

42. MATCHLESS (Sutton).—See p. 349. 45 per cent. survived.

15. ROUND-LEAVED (Barr *).—Stock not true. 20 per cent. survived.

(c) Medium size.

(1) Medium dull green.

1. WHITE MADEIRA (Barr), **H.C.** May 16, 1918.—Rather spreading, with a rather loose round heart; foliage somewhat blotched. Ready May 4. 70 per cent. survived.

(d) Small.

(1) Medium dark dull green.

38. COMMODORE NUTT (Sutton), **H.C.** May 16, 1918.—See p. 350. 70 per cent. survived.

(2) Medium dull green.

12. TOM THUMB, re-selected (Carter) } **H.C.** May 16, 1918.—See p. 350.
13. TOM THUMB, extra selected (Barr) } 50 per cent. survived.
14. TOM THUMB (Sydenham)**C. Semi-Cos Varieties.**

73, 74, 75. LITTLE GEM (Dawkins, Barr, Sutton).—See p. 350. 80 per cent. survived.

99. NONSUCH (Sutton).—See p. 350. 100 per cent. survived.

77. WINTER DENSITY (Toogood).—See p. 350. 100 per cent. survived.

D. Cos Varieties.

I. WHITE-SEEDED, FOLIAGE NOT TINGED RED OR BROWN.

a. Dark dull green.

1. Large, self-hearting.

79, 94. WHITE HEART (Sutton, Barr).—See p. 350. 66 per cent. survived.

2. Large, but dwarf, self-hearting.

76. DWARF PERFECTION (Sutton).—See p. 350. 80 per cent. survived.

b. Medium dark green.

1. Very large, self-hearting.

90. MONSTROUS WHITE (Webb).—See p. 357. 10 per cent. only survived.

* This sender does not yet list this variety.

2. Medium large.

104. COVENT GARDEN WINTER WHITE (Barr).—See p. 351. Under 10 per cent. survived.

c. *Medium green.*

1. Large.

100. DAVIES' HARDY GREEN (Cooper-Taber).—See p. 351. 80 per cent. survived.

96. SUPERB WHITE (Sutton).—See p. 351. Failed entirely. Germination good.

98. PEERLESS (Sutton).—See p. 351. Failed entirely. Germination good.

78. ST. ALBANS ALL HEART (Harrison).—See p. 351. 45 per cent. survived.

113. SUPERIOR HARDY WHITE (Harrison).—See p. 351. All survived.

2. Medium large, self-hearting.

91. IDEAL (Webb).—Only 15 per cent. survived.

92. MOOR PARK (Barr).—See p. 352. 35 per cent. survived.

4. Medium size, need tying.

102. HARDY WINTER WHITE (Hurst)

103. HARDY WHITE COS (Nutting)

105. HICKS' HARDY WINTER WHITE (Barr)

106, 107, 115. HICKS' HARDY WHITE (Cooper-Taber, Sydenham, Harrison)

} See p. 352. All survived.

d. *Light medium green.*

1. Large, self-hearting.

97, 101. WINTER WHITE (Sutton, Webb).—See p. 352. All survived.

II. BLACK-SEEDED.

a. *Foliage tinged or coloured brown or red.*

1. Self-hearting.

88. WALKER'S SUGARLOAF (Barr).—A mixed stock. See p. 352.

89. SOLID BROWN (Daniels).—See p. 352. All survived.

2. Need tying.

(a) Large.

111. BLOOD-RED WINTER (Barr).—See p. 352. 50 per cent. survived.

80, 86, 87. BATH COS (Sydenham, Hurst, Dobbie)

81. GIANT BATH COS (Barr)

82. BROWN OR BATH COS (R. Veitch)

84. COVENT GARDEN WINTER BROWN (Barr)

} See p. 352. 80 per cent. survived.

83. BLACK-SEEDED BATH (Sutton).—See p. 352. Hearted about same time as foregoing. 90 per cent. survived.

(b) Medium large.

85. CHAMPION BROWN (Sutton).—See p. 352. Stock requires further selection.

(c) Small medium.

110. ALL SEASONS (Barr).—Only two survived, and they did not heart.

b. *Foliage, not tinged red or brown, self-hearting.*

93. THE BARNUM (Barr).—See p. 353. A mixed stock. 20 per cent. only survived.

95. MAMMOTH WHITE (Sutton)}—See p. 353. 35 per cent. survived.

108. BALLOON (Barr)

EARLY POTATOS AT WISLEY, 1919.

OF the potatoes sent for trial at Wisley in 1919, as first early varieties, some were mid-season or late varieties, and were planted apart from those listed below, and of the one hundred and twenty-one stocks referred to there, a few (the season of which was not definitely known) proved to be too late to include among early varieties, and one or two others gave such small crops as to prove quite useless. The latter included a seedling sent in 1918, grown as No. 120, and 'Carbide' (No. 103). The former included, 'Mein's Early Round' (No. 111); 'Guthrie's' No. 75 (No. 102); Pink-eyed round seedling from Mr. Findlay (No. 97); 'Robson Seedling' (No. 68) of the 'British Queen' type, to which belong also 'Royal Scot' (No. 71), and 'Bell's Early' (No. 100); and 'Peace Abundance' (No. 104), a form near 'Abundance.' No. 22 (sent as 'Early York') proved a very mixed stock. Further reference to these is omitted. Most stocks proved true, but a few contained rogues. In view of the reasons upon which the Wart Disease orders are based, the freedom of stocks of potatoes from rogues is of the first importance.

The ground on which the tubers were planted had carried Brussels Sprouts in 1918. It was lightly manured, and dug as soon as the Brussels Sprouts had been cleared. The potatoes were planted on April 8, after being sprouted in the light, and on the whole made excellent growth. The season was very dry, but the ground was in good heart and the crop suffered little on account of lack of rain. In the notes given below, the crop from each trial row of twenty tubers is given.

The Fruit and Vegetable Committee inspected the growing crop on several occasions, and selected the most promising varieties for the cooking test. As a result of this they recommended the following awards (for particulars of senders and stocks see descriptive notes):—

Award of Merit.

'Western Hero' ('Duke of York' type), sent out by Messrs. R. Veitch.

Highly Commended.

'Eclipse,' sent out by Messrs. Sharpe. **A.M.** 1900, as 'Sir John Llewelyn' (Harris).

'Express,' sent out by Messrs. Sharpe.

'Midlothian Early' ('Duke of York' type), sent out by Messrs. Scarlett. **A.M.** 1908 as 'Midlothian Early' (Dobbie), and 1915 as 'Duke of York' (Simpson, Dobbie).

'Victor,' sent out by Messrs. Sharpe (**A.M.** 1893, Wythes).

'Witch Hill' ('Resistant Snowdrop' type), sent out by Messrs. Smith (F.C.C. 1912, Smith).

Commended.

'Early Champion,' sent out by Mr. Findlay.

'Epicure,' sent out by Messrs. Sutton (A.M. 1905, Sutton).

'Resistant Snowdrop,' sent out by Messrs. Dobbie. 'Snowdrop' received F.C.C. 1893 (Perkins).

In addition to the earlier awards mentioned above, the following varieties have received awards in the past, but were passed over by the Committee in the present trial in favour of those just mentioned: 'May Queen,' A.M. 1905 (Sutton, Hurst); 'Beauty of Hebron,' A.M. 1900 (J. Veitch); 'Ninetyfold,' A.M. 1900 (Sutton); 'Early Puritan,' A.M. 1900 (J. Veitch); 'Harbinger,' A.M. 1897 (Sutton).

VARIETIES IN THE TRIAL.

Note.—The descriptions will be found below in the section indicated by the letter following the name.

*1. Sharpe's Victor		45. Eclipse	
2. " "	d. 2.	46. " "	a. 1.
3. " "		47. " "	
4. May Queen		48. Sharpe's Eclipse,	a. 1.
5. " "		49. Sir John Llewelyn,	a. 1.
6. " "	a. 3.	50. Early Laxton,	d. 1.
7. " "		51. Ninetyfold	
8. " "		52. " "	d. 1.
9. Gladiator,	a. 2.	53. " "	
10. Dunottar Castle	a. 2.	54. Express	a. 4.
11. " "		55. " "	
12. Duke of York		56. Sharpe's Express	
13. " "	a. 1.	57. " "	a. 4.
14. " "		58. " "	
15. " "		59. " "	
16. Midlothian Early		60. Antrobus, No. 27,	a. 4.
17. " "		61. Early Royals,	b.
18. " "		62. Unnamed Kidney,	b.
19. " "	a. 1.	63. Seedling No. 12,	a. 2.
20. " "		64. Seedling, No. 28,	a. 3.
21. " "		65. Maghull Kidney,	a. 4.
22. Early York.		66. Seedling,	a. 4.
23. First Duke,	a. 1.	67. Unnamed Purple-eyed Kidney,	
24. New Lothian Early,	a. 1.	c. 3.	
25. Myatt's Ashleaf Kidney	a. 2.	68. Robson Seedling.	
26. " "		69. The Stewart Seedling,	a. 2.
27. Myatt's Improved Ashleaf,	a. 3.	70. Pessell's Perfection,	a. 1.
28. Improved Ashleaf,	a. 2.	71. Royal Scott.	
29. Myatt's Prolific Ashleaf,	a. 3.	72. Epicure	
30. Ashleaf Kidney,	a. 2.	73. " "	f. 1.
31. New Ashleaf Kidney,	a. 4.	74. " "	
32. Old Ashleaf,	a. 3.	75. America,	c. 1.
33. Resistant Snowdrop	a. 1.	76. Earliest Challenger,	f. 1.
34. " "		77. Midsummer Early,	e. 2.
35. Witch Hill		78. Crown Jewel,	e. 2.
36. " "	a. 1.	79. Arran Rose,	f. 1.
37. " "		80. Beauty of Hebron,	c. 1.
38. " "		81. Wonderfu Red Kidney,	c. 1.
39. Duke of Albany,	b.	82. Exhibition Red Kidney,	e. 2.
40. Harbinger	e. 2.	83. Entente Cordiale	d. 1.
41. " "		84. " "	
42. Puritan		85. Carisbroke Castle	
43. Early Puritan	d. 1.	86. " "	a. 2.
44. Western Hero,	a. 1.	87. " "	

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|-----------------------------------|--|
| 88. Alnwick Castle, <i>a.</i> 4. | 105. Edzell Blue, <i>f.</i> 1. |
| 89. Dunvegan Castle, <i>e.</i> 2. | 106. May Queen, <i>a.</i> 3. |
| 90. Climax, <i>f.</i> 2. | 107. Sharpe's Express, <i>a.</i> 4. |
| 91. Colonist, <i>a.</i> 1. | 108. Witch Hill Early, <i>a.</i> 1. |
| 92. Edzell Blue | 109. Epicure, <i>f.</i> 1. |
| 93. " " } | 110. Sir John Llewelyn, <i>a.</i> 1. |
| 94. " " } | 111. Mein's Early Round. |
| 95. " " } | 112. Keen's Seedling, <i>b.</i> |
| 96. " " } | 113. Pink Hebron, <i>c.</i> 1. |
| 97. Unnamed Pink-eyed Round. | 114. Witch Hill Seedling, <i>a.</i> 1. |
| 98. Eightyfold, <i>f.</i> 2. | 115. Dargill Early, <i>a.</i> 4. |
| 99. Early Champion, <i>f.</i> 1. | 116. Sharpe's Express, <i>a.</i> 4. |
| 100. Bell's Early. | 117. Resistant Snowdrop, <i>a.</i> 1. |
| 101. Ruby Queen, <i>f.</i> 3. | 118. Early Market, <i>e.</i> 2. |
| 102. Guthrie's 75's. | 119. Edzell Blue, <i>f.</i> 1. |
| 103. Carbide. | 120. Seedling. |
| 104. Peace Abundance. | 121. Coronation, <i>e.</i> 2. |

In the arrangement given below we have endeavoured to group close together the varieties most nearly allied, following the plan commenced in vol. xliii. p. 137. We must still regard the grouping as tentative; but on the whole it may be said that no garden need contain any two of the varieties which we have grouped together, for they are too much alike to be regarded as distinct. There seems no doubt that seedlings arise from time to time like already existing varieties in all characters, and such seedlings often receive new names.

An interesting and important thing to note is again the remarkable difference in yield between stocks from different places. In order to show this in a marked fashion, as well as to enable us to make varietal comparisons, Mr. W. Mauger of Guernsey was good enough to send us seed tubers of all the varieties commonly grown in the Channel Islands, and the low yield of Guernsey-grown seed was well brought out. Some varieties are apparently less liable to suffer from this cause than others, as shown by 'Jersey Royal' Kidney.

We have again to thank Messrs. Bone, Lasham, and Snell for valuable help in grouping the varieties and in many other directions.

DESCRIPTIONS.

(a) *Tubers Kidney, White or Yellow.*

1. Flowers white.

33, 34, 117. RESISTANT SNOWDROP (Dobbie, Simpson, Cross).—**C.**, September 5, 1919. For description see vol. xliii. p. 117. No. 33 (Edinburgh), crop 72 lb.; No. 34 (Lancashire), crop 63 lb.; No. 117 (Wisbech), 72 lb. Introduced by Messrs. Dobbie.

35, 36, 37, 38, 108, 114. WITCH HILL (Dobbie, A. Dickson, Mauger, Simpson, Barr, Cross).—**H.C.**, September 5, 1919. Characters as 'Resistant Snowdrop.' No. 35 (Edinburgh), crop 66 lb.; No. 36 (Co. Down), 64 lb.; No. 37 (Guernsey), 30 lb.; No. 38 (Lancashire), 68 lb.; No. 108 (Cornwall), 22 lb.; No. 114 (Scotland), 71 lb. Raised by Mr. A. Brown, of Fraserburgh.

70. PESSLE'S PERFECTION (Tottee).—Characters as 'Resistant Snowdrop.' Saltash, crop 53 lb. Raised by Mr. Hodge. Introduced by Messrs. Pessell.

45, 46, 47, 48. ECLIPSE (Dobbie, Holmes, Mauger, R. Veitch).—**H.C.**, September 5, 1919. Plant grey-green; haulm 24 in., erect, tinged bronze; foliage large, little crumpled; tubers generally flat kidney, but variable, large; skin light brown, rough; eyes small, shallow, eyebrows inconspicuous; flesh firm, white; mealy, white, and of good flavour when cooked. Crop No. 45 (Edinburgh), 74 lb.; No. 46 (Easter Ross, Ross-shire), 80 lb.; No. 47 (Guernsey), 25 lb.; No. 48 (Dumfries) 71 lb.

49. 110. SIR JOHN LLEWELYN (Veitch).—Characters as in 'Eclipse.' Crop No. 49 (Dumfries), 72 lb. Raised and introduced by Mr. J. Harris. No. 110 (Scotch), 77 lb.

91. COLONIST (Webb).—Characters as in 'Eclipse.' Stock not true, 18 plants gave 63 lb. (Fife). Origin doubtful, introduced by Messrs. Webb.

12, 13, 14, 15. DUKE OF YORK (Holmes, McAlister, Simpson, R. Veitch).—H.C., September 5, 1919. Plant grey-green; haulm 24 inches, more or less spreading, slightly tinged purple; foliage large, almost smooth, dull, flat; flowers creamy white; tubers of medium size, flat kidney; skin rough, dark yellow; eyes medium, shallow; eyebrows fairly conspicuous; flesh firm, yellow; firm, somewhat mealy, yellow when cooked; flavour fair. Crop No. 12 (Easter Ross), 61 lb.; No. 13 (Dumfries), 68 lb.; No. 14 (Scotland), 83 lb.; No. 15 (Dumfries), 66 lb.

16, 17, 18, 19, 20, 21. MIDLOTHIAN EARLY (Dobbie, Holmes, Mauger, McAlister, Webb, R. Veitch).—Characters as 'Duke of York.' Crop No. 16 (Edinburgh), 71 lb.; No. 17 (Easter Ross), 67 lb.; No. 18 (Guernsey), 10 lb.; No. 19 (Dumfries), 46 lb. *; No. 20 (Lanarkshire), 51 lb.; No. 21 (Dumfries), 78 lb. Introduced by Messrs. Scarlett.

23. FIRST DUKE (A. Dickson).—A very regular stock, characters as 'Duke of York.' Crop (Co. Down), 68 lb. Introduced by sender.

24. NEW LOTHIAN EARLY (Scarlett).—A seedling with the characters of 'Duke of York,' but not vigorous. Crop (Edinburgh), 38 lb. Introduced by sender.

44. WESTERN HERO (Veitch).—A.M., September 5, 1919. Characters as in 'Duke of York'; a very good stock. Crop (Dumfries), 81 lb. Introduced by sender.

2. Flowers pale lilac.

85, 86, 87. CARISBROOKE CASTLE (Holmes, Mauger, Sutton).—Plant mid-green; haulm 15 in. to 18 in., erect, tinged purple; foliage large, rough, crumpled; tubers flat kidney, large, finely russeted; skin light brown; eyes small, shallow; eyebrows conspicuous; flesh firm, light lemon. Crop No. 85 (Easter Ross), 62 lb.; No. 86 (Guernsey), 40 lb.; No. 87 (Scotland), 38 lb. Raised by Rev. A. Paton, introduced by Messrs. Sutton.

10, 11. DUNOTTAR CASTLE (Mauger, Sutton).—Plant green; haulm 18 ins. somewhat spreading, tinged purple; foliage large, smooth, shining, flat; tubers large, long and flattened, skin light yellow; eyes very shallow; eyebrows conspicuous; flesh firm, white. Crop No. 10 (Guernsey), 5 lb.; No. 11 (Scotland), 50 lb. Raised by Mr. Paton. Introduced by Messrs. Sutton.

69. STEWART SEEDLING (Gavin).—Plant greasy medium green; haulm 18–24 ins., compact, erect, much tinged purple; foliage large, smooth; flowers many; tubers flat kidney, large; skin light brown, finely russeted; eyes medium depth; eyebrows conspicuous; flesh firm, light yellow; mealy, white to pale yellow when cooked; flavour fair. Crop (Aberdeenshire), 54 lb. Earlier than 'Eclipse.' Raised by Drumwhindle School, Ellon, not yet on market.

63. GUTHRIE, No. 12 (Guthrie).—Plant medium green; haulm 12 to 16 ins. with little purple tinge; foliage medium, leaflets pointed, smooth, shining, some tendency to 'curl'; tubers medium to small, long kidney; skin light brown, coarsely russeted; eyes shallow; eyebrows inconspicuous; flesh firm, yellow. Crop (Fife), 32 lb.

Seedling from 'Duke of York,' raised by sender, not yet on market.

25, 26. MYATT'S ASHLEAF (McAlister, Veitch).—Plant dark green; haulm 18 to 24 inches, compact, erect, tinged purple; foliage of medium size and width, smooth, dull, little crumpled; tubers of medium size, long kidney; skin light yellow, smooth; eyes large, rather shallow and prominent; eyebrows conspicuous; flesh firm, yellow (rather paler than 'Duke of York'). Crop No. 25 (Dumfries), 82 lb.; No. 26 (West of Scotland), 68 lb.

28. IMPROVED ASHLEAF (Webb).—Characters as in 'Myatt's Ashleaf.' Crop (Fifeshire), 59 lb.

30. VEITCH'S ASHLEAF KIDNEY (R. Veitch).—Characters as in 'Myatt's Ashleaf.' Crop (Scotland), 58 lb.

[N.B.—This form is distinct from Nos. 27 and 29 (see below).]

* Yield too low owing to a very local bad patch of soil.

9. **GLADIATOR** (Sutton).—Plant grey-green; haulm 18 to 24 inches erect; much tinged purple; foliage large, rough; tubers large, uniform, long kidney; skin light brown, smooth; eyes fairly large, shallow; eyebrows conspicuous; flesh white, firm. Crop (Scotland), 76 lb. Raised by Mr. R. W. Pinney. Introduced by Messrs. Sutton.

3. Flowers dark mauve.

4, 5, 6, 7, 8, 106. **MAY QUEEN** (Dawkins, McAlister, Sutton, R. Veitch, Webb, Barr).—Plant greasy medium green; haulm 24 in. erect, slightly tinged purple; foliage large, smooth, dull, flat; flowers dark mauve with white striped centre; tubers long kidney, large to medium; skin light brown, more or less rough; eyes shallow; eyebrows conspicuous; flesh firm, light lemon; firm, waxy, white when cooked. Crop No. 4 (Surrey), 35 lb.; No. 5 (Dumfries), 92 lb.; No. 6 (Lincolnshire), 73 lb.; No. 7 (Scotland), 71 lb.; No. 8 (Kinver Hill), 49 lb.; No. 106 (Scotland), 59 lb. Introduced by Messrs. Sutton.

[No. 32 sent as 'Old Ashleaf' was a weak stock of 'May Queen.' Crop (Cheshire), 22 lb.]

27. **MYATT'S IMPROVED ASHLEAF** (McAlister).—Plant yellowish-green; haulm 24 inches, slightly tinged purple; foliage large, leaflets broad, smooth, dull; tubers medium, long kidney; skin light brown, more or less rough; eyes small, shallow; eyebrows fairly conspicuous; flesh firm, light yellow. Crop 81 lb. (Dumfries).

29. **MYATT'S PROLIFIC ASHLEAF** (Webb).—Characters as in No. 27. Crop (Fifeshire), 43 lb. from 17 plants. Stock mixed.

[N.B.—This form is quite distinct from the old 'Myatt's Ashleaf,' and might well be called the 'Broad-leaved Ashleaf.']

64. **GUTHRIE**, No. 28 (Guthrie).—Plant somewhat yellowish-green; haulm 18 inches, more or less decumbent; foliage medium, rough, dull; flowers white-tipped; tubers of medium size, long kidney; skin light yellowish-brown, rough and russeted; eyes large, shallow; eyebrows conspicuous; flesh firm, light yellow. Crop (Fifeshire), 51 lb. Raised by Messrs. Guthrie; not yet on market.

4. Flowers drop in bud.

54, 55, 56, 57, 58, 59, 107, 116. **SHARPE'S EXPRESS** (Webb, Dickson & Robinson, Dobbie, Mauger, Simpson, R. Veitch, Barr, Cross).—H.C. September 5, 1919. Plant mid-green; haulm 24 inches; tinged purple; foliage large, smooth, flat, shining; flowers coloured; tubers large to medium, long kidney, flattened; skin rather rough, finely russeted, light brown; eyes shallow; eyebrows conspicuous; flesh firm, pale lemon; firm, mealy and white when cooked; flavour good. Crop No. 51 (Worcestershire), 62 lb.; No. 55 (Scotland), 73 lb.; No. 56 (Edinburgh), 79 lb.; No. 57 (Guernsey), 30 lb.; No. 58 (Scotland), 66 lb.; No. 59 (Dumfries), 70 lb.; No. 107 (Scotland), 75 lb.; No. 116 (Wisbech), 71 lb.

65. **MAGHULL KIDNEY** (Clucas) proved to be identical with 'Sharpe's Express.' Crop (Lancashire), 64 lb.

60. **ANTROBUS**, No. 27 (Miln).—Characters as 'Sharpe's Express.' Raised by Mr. T. E. Miln between 'Express' and 'Excelsior.' Crop (Forfar), 59 lb.

66. **SEEDLING** (Phillipson).—Characters as 'Sharpe's Express.' Raised by Mr. Phillipson. Crop (Birmingham), 31 lb.

31. **NEW ASHLEAF KIDNEY** (Scarlett).—Characters as 'Sharpe's Express,' but plants yellowish-green. Not quite true. Crop (Musselburgh), 29 lb. Raised by Mr. Mollison, introduced by Mr. Scarlett.

88. **ALNWICK CASTLE** (Sutton).—Plant grey-green; haulm 24 inches, scarcely tinged; foliage large, rough, dull; tubers large; long kidney; skin smooth, light yellow; eyes shallow; eyebrows conspicuous; flesh firm, white to pale lemon, firm, waxy, white to pale yellow when cooked; flavour fair. Crop (Scotland), 89 lb. Raised by Rev. A. Paton. Introduced by Messrs. Sutton.

115. **DARGILL EARLY** (Cross).—Plant dark green; haulm 18 to 24 inches, tinged purple; leaves fairly large, smooth, shining, somewhat crumpled; tubers of medium size, long; skin smooth, light yellow; eyes many, of medium size, shallow; eyebrows conspicuous; flesh firm, light yellow; firm, waxy, white when cooked. Crop (Scotland), 58 lb.

(b) Kidney slightly coloured.

61. **EARLY ROYAL** (Mauger).—Plant dark green; haulm 18 inches, very erect, deeply tinged chocolate-brown; foliage large, rough, dull; tubers large, sometimes flattened; skin smooth, light brown, with a tinge of pink; eyes large, shallow; eyebrows conspicuous, very long; flesh firm, pale lemon; firm, waxy, and faintly yellowish when cooked; flavour fair. Crop (Guernsey), 48 lb.

39. **DUKE OF ALBANY** (Mauger).—Characters as in 'Early Royal' of which it appears to be a selection. Crop (Guernsey), 49 lb.

62. **SEEDLING KIDNEY** (Raine).—Characters as in 'Early Royal.' A seedling raised by Mr. Raine. Crop (King's Heath), 12 lb.

112. **KEEN'S SEEDLING** (Keen).—Characters as in 'Early Royal.' Crop (Ipswich), 78½ lb.

(c) Kidney, coloured.

1. Flowers white.

81. **WONDERFUL RED KIDNEY** (Scarlett).—Plant dark green; haulm 18 inches, spreading, tinged with purple; foliage small, leaflets sessile, rough, dull, crumpled; tubers of medium size, long kidney; skin dark pink, smooth; eyes shallow; eyebrows conspicuous, long; flesh firm, pale lemon. Crop (Musselburgh), 32½ lb. Introduced by Mr. Scarlett.

80. **BEAUTY OF HEBRON** (R. Veitch).—Plant very vigorous, yellowish green; haulm 27 inches, fairly erect, tinged purple; foliage large, rough, dull, flat; tubers large, long kidney; skin light yellow, much tinged pink; eyes many, large, deep; eyebrows inconspicuous; flesh dull white, firm. Crop (Dumfries), 83 lb.

113. **PINK HEBRON** (Cross).—Characters as No. 80. Crop (Wisbech), 78 lb.

2. Flowers pale lilac.

82. **EXHIBITION RED KIDNEY** (Dobbie).—Plant dark green; haulm 20 inches; spreading, tinged purple; foliage large, leaflets long, petioled, rough, dull, crumpled; tubers large, long kidney; skin smooth, dark reddish pink; eyes few, of medium size, shallow; eyebrows conspicuous; flesh rather dry, white with flecks of carmine. Raised and introduced by Messrs. Dobbie. Crop (Edinburgh), 40 lb.

3. Flowers dark mauve, with white streaks.

67. **PINK-EYED KIDNEY** (Findlay).—Plant dark green; haulm 24 inches rather spreading, much tinged purple; foliage large, rough, dull, flat; tubers large, long kidney; skin smooth, yellowish-white with much pink tinge; eyes many, large, shallow; eyebrows distinctly coloured; flesh firm, yellowish-white with some pink streaks; mealy, white when cooked; flavour fair. Raised by Mr. Findlay. Crop (Fife), 60 lb.

(d) Tubers flat-round or round, white.

1. Flowers white.

51, 52, 53. **NINETYFOLD** (McAlister, Sutton, R. Veitch).—Plant yellowish grey-green, somewhat variegated; haulm 18 to 24 inches, compact, erect, somewhat tinged purple; foliage large, purple on upper side of petiole, rough, dull, flat; tubers large, rather long, flat; skin yellow; eyes large, rather prominent; eyebrows conspicuous; flesh firm, white. Crop No. 51 (Dumfries), 74 lb.; No. 52 (Scotland), 62 lb.; No. 53 (Dumfries), 64 lb. Raised by Mr. Jas. Clark. Introduced by Messrs. Sutton.

83, 84. **ENTENTE CORDIALE** (Dobbie, Findlay).—For description see vol. xliii. p. 118. Crop No. 83 (Edinburgh), 28 lb.; No. 84 (Mairsland, Fifeshire), 84½ lb. Raised and introduced by Mr. Findlay.

50. **EARLY LAXTON** (Laxton).—Plant very weak. Crop (Bedford), 22 lb.

42, 43. **EARLY PURITAN** (A. Dickson, Veitch).—Stock mixed.

2. Flowers coloured.

1, 2, 3. **SHARPE'S VICTOR** (Holmes, McAlister, R. Veitch).—H.C., September 5, 1919. Plant mid-green, haulm 18 to 24 inches; erect, somewhat tinged purple; foliage large, rough, greasy; flowers lavender with faint white tips; tubers

medium, flat-round; skin light yellow; eyes rather prominent; eyebrows conspicuous; flesh firm, light yellow; firm, mealy, and yellowish when cooked. Crop No. 1 (Easter Ross), 65 lb.; No. 2 (Dumfries), 83 lb.; No. 3 (Dumfries), 87 lb.

(e) *Tubers typically round, white.*

1. Flowers light mauve.

57. AMERICA (Dobbie).—This stock was not typical in growth. Tubers of 'Epicure' type, but without colour in skin. Crop (Edinburgh), 15 lb.

2. Flowers drop in bud.

118. EARLY MARKET (Cross).—Plant dull yellowish green; haulm 24 to 30 inches, fairly erect, green; foliage large, crumpled, rough; tubers of medium size, variable in shape; skin light brown, smooth; eyes small, deep; eyebrows conspicuous; flesh pale lemon, firm. Crop (Wisbech), 64 lb.

77. MIDSUMMER EARLY (Findlay).—Plant yellowish green; haulm 16 inches, spreading, decumbent; slightly tinged; foliage large, flowers white; tubers large, rather variable in shape; skin light-brown, rough; eyes many, large, shallow; eyebrows conspicuous; flesh firm, pale lemon. Crop (Fifeshire), 43 lb. Raised and introduced by sender.

89. DUNVEGAN CASTLE (Sutton).—Plant yellowish green; haulm 16 to 18 inches; more or less spreading and decumbent, slightly tinged; foliage large; flowers white; tubers large, rather variable in shape; skin light-brown, rough; eyes few, large, shallow; eyebrows conspicuous; flesh firm, pale yellow; soft, mealy, white and of good flavour when cooked. Crop (Scotland), 48½ lb. Raised by Rev. A. Paton; to be introduced by sender.

78. CROWN JEWEL (Toogood).—An untypical stock. Crop, 34½ lb.

121. CORONATION.—Characters as 'Crown Jewel.' Crop, 52 lb.

3. Flowers none.

40, 41. HARBINGER (McAlister, Sutton).—Plant yellowish green; haulm 16 inches; spreading, decumbent; slightly tinged; foliage large, shining; tubers of medium size, somewhat variable in shape; skin light-brown, rough; eyes small, shallow; eyebrows inconspicuous; flesh firm, rather dry, white. Crop No. 40 (Dumfries), 32 lb.; No. 41 (Scotland), 44 lb. Raised by Mr. Shakeshaft; introduced by Messrs. Sutton.

(f) *Tubers round, coloured.*

1. Flowers white.

72, 73, 74, 109. EPICURE (Dobbie, McAlister, Sutton, Barr).—C., September 5, 1919. Plant yellow-green; haulm 18 to 24 inches, compact, erect; much tinged purple; foliage large, dull, flat; tubers large; skin light-brown, tinged pink; eyes large, deep, pink; eyebrows conspicuous; flesh firm, pale lemon; firm, waxy, white, of fair flavour when cooked. Crop No. 72 (Edinburgh), 38½ lb.; No. 73 (Dumfries), 41 lb.; No. 74 (Scotland), 91½ lb.; No. 109 (Scotland), 96 lb. Raised by Mr. Jas. Clark; introduced by Messrs. Sutton.

76. EARLIEST CHALLENGER (Houliston).—Characters as 'Epicure.' Crop (Dumfries), 69½ lb. Raised by sender.

99. EARLY CHAMPION (Findlay).—C., September 5, 1919. Plant medium green; haulm 20 inches, compact, erect, slightly tinged; foliage large, dull, flat, midrib coloured; petioles coloured; tubers large, skin light-brown, much tinged with pink; eyes large, deep pink; eyebrows conspicuous; flesh firm, juicy, white; firm, mealy, white when cooked; flavour fair. Crop (Fifeshire), 73½ lb. Raised and introduced by sender.

79. ARRAN ROSE (Dobbie).—Plant medium green; haulm 24 inches, erect, slightly tinged purple; foliage large, rough, dull, nearly flat; tubers of medium size, rather variable in shape; skin light brown, much tinged pink; eyes of medium size, shallow, pink; eyebrows conspicuous; flesh waxy, white, but of rather soapy flavour when cooked. Crop (Edinburgh), 56½ lb. Raised by Mr. McKelvie; introduced by sender.

92, 93, 94, 95, 96, 105, 119. EDZELL BLUE (Dickson & Robinson, Dobbie, Scarlett, Simpson, R. Veitch, Barr, Cross).—For description see vol. xliii. p. 118. Crop No. 92 (Cheshire), 83 lb. ; No. 93 (Edinburgh), 81 lb. ; No. 94 (Musselburgh), 59½ lb. ; No. 95 (Scotland), 85½ lb. ; No. 96 (Dumfries), 78 lb. ; No. 105 (Scotland), 79 lb. ; No. 119 (Scotland), 87½ lb.

2. Flowers coloured.

98. EIGHTYFOLD (Dobbie).—Plant yellowish green, but not very typical. Flowers blue, tipped white ; tubers medium in size, dark purplish-blue ; eyes deep ; flesh firm, white. Crop (Edinburgh), 24½ lb. Raised and introduced by Mr. Findlay.

90. CLIMAX (Dobbie).—Plant dark green ; haulm 24 to 28 inches, spreading, decumbent, much tinged purple ; foliage medium in size, midribs tinged, rough, dull ; flowers dark reddish purple ; tubers large, dark pink with brown patches ; eyes large, deep, pink ; eyebrows yellowish ; flesh firm, dark yellow. Crop (Edinburgh), 51 lb.

3. Flowers drop in bud.

101. RUBY QUEEN (Findlay).—Plant dark green, shining ; haulm 18 inches, spreading, decumbent, much tinged purple ; foliage large, rather rough ; tubers large or medium ; skin brown, deeply tinged bluish purple ; rough ; eyes shallow, large ; eyebrows purplish ; flesh firm, pale lemon. Crop (Fifeshire), 31 lb. Raised and introduced by sender.

COMMONPLACE NOTES.

By the EDITOR.

EXCHANGE OF PLANTS.

OUR Fellow Mr. R. F. SILVERS, of Avery Island, Louisiana, U.S.A., is desirous of exchanging rare plants (both native and foreign) with plant lovers, and is especially anxious to get into correspondence with cultivators of plants in the British Colonies.

' CANNON HALL MUSCAT ' GRAPE.

Mr. SPENCER PICKERING, F.R.S., writes: "Is there any means of regaining orthography for the Cannon Hall Grape, which is generally quoted as 'Canon Hall' or even 'Canon Hale'? Its sponsor was not a pillar of the Church, but my grandfather, John Spencer Stanhope, of Cannon Hall, near Barnsley. When travelling in Greece in 1814, he sent home cuttings of various vines, and one of these originated the Cannon Hall Grape. He exhibited it at Versailles about 1822, and as it beat all competitors there he presented a plant of it to the Botanical Society in London, and allowed it to become public property on the understanding that it should be named the 'Cannon Hall Grape.' The original vine came to grief about thirty years ago through a ladder falling on it." We hope this note may do something to preserve the correct name of this delicious grape.

OLD JOURNALS.

The demand for recent numbers of the R.H.S. JOURNAL has been so great that several of them are quite out of print, and we still have many inquiries for them. Vol. XLIII., Part 1, published in May 1918, Parts 2 and 3 published in February 1919, and Vol. XLIV., published in May 1919, are quite exhausted, and if any Fellow has a copy of either of these which is of no further use to him the Secretary will be greatly obliged if he will send it to the Office at Vincent Square, S.W. 1.

BOOK REVIEWS.

"Science and Fruit Growing." By the Duke of Bedford, K.G., F.R.S., and Spencer Pickering, M.A., F.R.S. 8vo. xi + 350 pp. (Macmillan & Co., London, 1919.) 12s. 6d. net.

Twenty-five years have elapsed since the establishment of the Woburn Experimental Fruit Farm, and this book deals with many of the investigations familiar to readers of the various Reports which have been issued from time to time by the authors. It forms an invaluable handbook of the latest ideas as to the best cultural practices and their scientific bases, and a knowledge of its contents is indispensable to anyone who regards himself as an up-to-date exponent of the principles governing the planting of fruit-trees, and their subsequent management. Its style is a model of clearness and conciseness, and there are no unnecessary technicalities, though the chemical formulæ in the chapters on insecticides and fungicides will doubtless tax those whose memory of such has been lost in the tide of years.

When the Farm was started in 1894, scientific practice had scarcely begun to be applied to fruit-growing, and, as was to be expected, the results of the tests and experiments have been to expose the fallacy of many generally held beliefs and rule-of-thumb methods. Some of the results as set forth in the Reports have been violently opposed, sometimes with the addition of personal abuse, the authors tell us in the preface, and one or two of these results are discussed here with an open mind. For instance, the damaging effects of grass over the roots of young fruit-trees is admittedly accentuated on the Farm by the shallowness of the surface soil, and the impenetrability of the Oxford clay subsoil which make it impossible for the roots of the trees to get away from the grass (p. 308). Again, the beneficial effects of the careless planting of trees, which has been the cause of so much adverse criticism, is shown to be mainly caused by the ramming to which such trees were subjected (p. 33), this bringing a larger portion of the main roots into intimate contact with the soil, thus inducing the formation of greater numbers of new root fibres, and those of a strength and vitality which the delicate fibrous roots we used to be told to lay out so carefully are quite incapable of producing, even if they live after the drying during removal. It is interesting to note that one large firm this winter is advising its customers to ram the soil about the roots when planting. These results, and their broad treatment, constitute an object-lesson to us in our attitude to new methods and theories.

The authors admit that some of the results are at present difficult of explanation. For instance, in planting gooseberries and currants, the new root formation from roots which were broken was two and

a half times as great as that when the roots were cut, or cleanly trimmed (p. 35). Another effect, at present unexplained, is the great response made by bush fruits, especially gooseberries, to the use of animal manure, and the almost entire absence of effect when the same treatment is applied to apples. Still another unexplained point in the behaviour of bush fruits was the adverse effect of planting gooseberries and black currants in trenched ground at Rothamsted, as compared with untrenched ground, while, in the case of fruit-trees generally, the effect of trenching before planting was so slight that the authors say it is not an operation on which the fruit-grower will spend his money. Some of us are so conservative on this matter that we cannot quite give up the idea that these results may be due to something out of the ordinary in some other conditions present.

The possible causes of the effect of grassing over the roots of trees are still discussed at length (pp. 275-289), as well as the general subject of the toxic action of one crop on another. Some of the other interesting subjects dealt with, in addition to those lightly touched upon above, are pruning, especially as regards newly planted trees, spring frosts, the alternate fruiting of trees, mussel scale, currant gall (or big bud), and other pests, silver leaf, potato disease, and the action of various washes.

In conclusion, a good index and chapter-analyses add to the value of the book for ready reference.

"The English Rock-Garden." By R. Farrer. 2 vols. lxiv + 504 + viii + 524 pp. 8vo. (Jack, London, 1919.) 3 guineas net.

The author of this work set himself no light task when he planned its dual character. At first sight it suggests the proverbial result of endeavouring to sit upon two stools. Increasing acquaintance with its contents, and testing its pages in search of desired information, show that the task has been brought to an admirable finish.

One half of the plan was to treat plants already grown in rock gardens, or likely to be grown therein, somewhat after the fashion in which the Abbé Coste has dealt with the native plants of France in his most useful book; that is, to lay stress on the most noticeable and distinguishing characters by which one species can be distinguished most easily from another. For this purpose, Mr. Farrer turned to the original Latin diagnoses of the plants, and has selected from them the essential points, that he may make them available to all his readers in short English descriptions.

The other aim he keeps in view is, while making these descriptions as definite and authoritative as their Latin originals, yet to express them in the conversational and often picturesque or quaint English he has such a gift for employing.

Thus we find a complete absence of botanical terms, except such as calyx-lobe, axil, corolla-tube, &c., which should prove strange to no one who owns a garden or a gardening book.

To test the value of this new dictionary of rock-garden plants, one

may note the author's treatment of one genus, say *Gentiana*. About one hundred and fifty named species or forms are included. Arranged in alphabetical order, it is easy to turn to the one needed. An introductory note wittily describes the difficulties of cultivating most of the species. To quote :—" Perhaps *Gentiana* offers the rock-garden more glory than any other race, or more persistently denies it." . . . " There is no jesting with a gentian, except, indeed, when the gentian does the jesting—grows ample and splendid and hearty, only to gratify you at the end with dingy little flowers and a mass of foliage, so ill-pleasing that you feel indeed more mocked by such a success than if the plant had followed the example of its beautiful cousins and wholly refused to grow." Then follows an excellent description of the construction of an ideal gentian bed, and advice as to companion plants suitable for the various groups of the family. " Company the plant must have, for even the High-Alpine species . . . are grateful in the garden for a little fine society to distract them from their thoughts of home." Covering with glass in winter is recommended to ensure " a cent. per cent. return next season in the way of flower." As a means to effect this, it is revealed that the " enthusiastic have been known to subsist on glass-potted tongues and shrimps in order that the receptacles of these delicacies should afford a sufficient number of roofs to shelter all their gentians in winter."

Under *G. acaulis* we find, for the first time in one book, a clear statement of the various distinct species that have long been confused under that name by various authors. Italics point out the salient characteristics by which each may be readily recognized from its most similar relation. The fine old plant of our gardens, which is unknown as a wild plant of the hills, stands as *G. gentianella*. *G. latifolia* includes the many names given to the commonest and dullest of the large *acaulis* forms of the Alps, and *G. vulgaris* the more beautiful form of the limestone heights.

The author's researches lead him to adopt the name *G. aestiva* for that major cousin of *G. verna* we have hitherto been content to call *G. angulosa*. Some species are appraised highly—thus *G. barbellata* is " a rare species of Colorado for a choice place in the choice bed." *Kurroo* has " magnificent great flowers, widely gaping cups of pure rich blue . . . flecked with interior pallors and altogether lovely." On the other hand, *G. Burseri* is " a leafy, tall, yellowy-brown ugliness," and *dahurica* a " coarse and worthless leafy cluster-head of dowdy bloom and overwhelming leafage." Species from New Zealand, such as *G. divisa*, *corymbiflora*, and *lineata*, are included alongside such newly introduced Chinese species as the glorious turquoise-blue *G. Farreri*, *hexaphylla*, *trifolia*, *Purdomii* and others, so new as to find mention in the Appendix, rendered necessary by the author's travels in China since the main part of the book was written.

In these two large volumes, then, we find a compendious, comprehensive and up-to-date guide to the plants that are rightly or doubtfully classed as subjects for the rock-garden. Many not yet

introduced are included against the day of their arrival, some so faintly praised that one hopes that day will not come in our time. Allowing for the author's personal taste in plants, this outspoken expression of opinion should prove of great assistance to the gardening fraternity in their choice of species for their collections. The illustrations are excellent, representing about 200 different plants. Many are from photographs taken in the Royal Botanic Gardens of Kew and Edinburgh, or in the wilds of China, but the greater number are from Mr. Malby's camera. All show the natural habit of growth of the plants.

Coming from one who has so wide an acquaintance with alpine plants in Europe and Asia, and as the result of so much careful research in the works dealing with mountain floras, "The English Rock-Garden" is likely to remain the text-book of would-be gardeners for many years to come.

"Garden Ornament." By Gertrude Jekyll. xii + 460 pp. ("Country Life," London, 1918.) £3 3s. 0d.

It is the opinion of many that the first impression made by a future friend counts for much. If this is so with people, it is accentuated in our opinions with regard to books. From the moment when this long-anticipated volume is taken from the hands of the postman, we know that it is no ordinary production that we are about to have sight of. The book is unwieldy, heavy, and such as only those who have ample leisure can contemplate purchasing. It is a matter for regret that the writer, so well known an expert upon Gardencraft, has been allowed by the publishers to sink into comparative insignificance, because the pictures which "Country Life" wished to reproduce take up most of the pages. There is a very marked and regrettable shortage of the writer's views and comments. When we are fortunate enough to obtain these, as, for instance, in the recommendation that summer-houses should have good light (on p. 197), and also the suggested use of fine treillage work for fruit trees (p. 306), we feel all the more aggrieved that so small a space was allowed for Miss Jekyll's comments and suggestions. If it was necessary to limit the work to one huge volume, would it not have been far more serviceable to the lay reader if fewer pictures had been inserted and each one had received some remark from the pen of the writer? We should thus have gained knowledge in regard to garden design, and we should have had an opportunity of comparing our own views with those of one who has given many years to the study of garden work. It would have been possible to see more examples, such as is shown on p. 190, where the parapet of the orangery is suggested as a means of concealing the glass roof. Then, too, more information could have been added in regard to the historic side of garden-planning; perhaps more dates could have been included, and each picture of a remarkable gate-house or an old bridge would thus have taught us the transition in style that was taking place at the time it was built. For instance, we long

to know more of the Holbein porch at Wilton House (p. 219). Also the rare reproduction of so beautiful a specimen of stone-work as the Nailsea Court summer-house calls for more detailed remarks concerning its history. The many reflections that the writer could have handed on to us are evident, at times, as we turn over the pages. She wonders why Pergolas have only so recently been brought to Northern countries whilst other ideas from Italy have been freely used for so many centuries. It is when free scope is allowed to a capable writer that sound lessons are learnt from illustrated books.

In regard to the way in which the pictures have been grouped together, we should, we confess, have preferred having a more marked distinction between those water-gardens where only still reflections are called for, and those where life and vivacity are created. The complete difference between the mirror-like effects obtainable from canals or silent pools, and the noise and buoyancy of sparkling, rushing, moving water could be more markedly shown if the various illustrations were grouped together in their respective classes. The study of water has been somewhat neglected in our English parks and gardens hitherto, but the time has come when a new *Le Nôtre*, it is hoped, will arise and, with a true magician's wand, call into being a few of those fine effects that we all have learnt to admire amidst the stately avenues of Versailles.

"Economic Trees and their By-products." By Mrs. M. Grieve. 8vo. 70 pp. (The Author, The Whins, Chalfont St. Peter, Bucks [1926].) Paper covers, 1s. 6d.

The sub-title describes the contents: "A concise account of over 70 species of trees that readily grow in Great Britain and which possess valuable by-products, now either neglected or entirely wasted." Large as the number may seem, it might easily have been larger; for some well-known trees (if we may be permitted to use the term as the author does, to include shrubs as well) are omitted, although they are hardy and yield products of value. The list will prove of interest and of value to many, and will serve to show how many unconsidered trifles have been from time to time turned to account.

"Manual of Vegetable-Garden Insects." By C. R. Crosby and M. D. Leonard. 8vo. 226 figs. i + 381 pp. (Macmillan, London, 1918.) 10s. 6d.

This book is intended as a guide to the insect pests of the United States and Canada. The most important pests are given, together with their life histories and remedies.

Eighteen chapters of the volume deal with insects attacking certain groups of plants, such as the cabbage family, peas and beans, asparagus etc. Chapter 19 is devoted to a rough classification of insects, explaining particularly their mouth parts. It concludes by giving a list of the principal insecticides.

Many of the insects are well known in this country, and the book can be profitably perused as to the general habits of well-known pests and the measures to be taken against them.

The sodium-arsenite bait (given as a preventive against the Onion Fly) should be wider known in this country, on account of the great success obtained in America and Canada.

"Timbers and their Uses." By Wren Winn. 8vo. 333 pp. (Routledge, London, 1919.) 10s. 6d. net.

This is an ambitious book, in the compilation of which many well-known authors have been pressed into service, including Laslett, Boulger, Ward, and Webster.

Though the book contains little that is new, the arrangement presents information in a concise and accessible form. For instance, in the chapter on "The Uses of Wood," which occupies about one-third of the work, the author

gives a list—though by no means a complete one—of timbers for special purposes, such as bridge-making, cabinet work, furniture, turnery, carving, and such-like, arranged in alphabetical order. The geographical distribution of timber is an interesting subject, and the author has wisely, in such a gigantic undertaking, divided the chapter approximately into continents, though even in this way, repetitions are unavoidable.

Regarding the "World's Timber Resources" a great amount of useful information and statistics have been culled from different sources, though to obtain reliable data of such would, as the author says, be an impossible task, and would be true for a very limited period. Under "Manufactures &c." a great amount of valuable information is recorded, and the notes on basket-making, charcoal manufacture, fuel, and tanning are up to date, the authors of the information being well known for their researches on the various subjects. Fungus and insect pests cause great damage both to the living wood and converted timber, and both subjects have received a considerable share of attention in this book, though the best means of dealing with such attacks as dry rot, the very destructive beech-coccus, and other pests of the woodlands receive scant notice.

We hardly think that the author has been definite enough on the attacks of such well-known insects as the pine-beetle, leopard-moth, and willow-mite on our home-grown timbers.

The practical side of the uses of wood in the various manufactures, with its structure and formation, methods of seasoning and testing for various purposes, are all interesting reading, and the letterpress is illustrated by nearly a hundred photographs, which, though not very distinct, will yet be useful in elucidating the text.

"Romance of the Wonder Plot." By W. G. Moore and A. Smith. 84 pp. 8vo. (Romance Publishing Co., 1920.) Paper covers, 2s. 6d. net.

That such results as are described in this little book can be attained there can be no doubt—indeed, three crops a year are frequently secured when soil is in good heart and skill is used in arranging them. The raising of crops valued at the rate of £500 an acre per annum is no dream, but a result fairly frequently achieved, especially on small plots. With this part of the book (even though much of it is written in irritating journalese), and with its object of helping to secure reasonable permanence of tenure for allotment holders, we have no quarrel, and so far the book will do good. But much harm is done to a good cause by such books when, as here, comparisons quite unfair are made between the results obtained on a small plot and on the farm. That the latter may be improved goes without saying, but the improvement must be along economic lines. The "law of diminishing returns" soon begins to work if care is not exercised in adjusting manurial requirements and labour expenses to the value and yield of the crop.

Here, according to the authors, three hours a day are devoted to a 12-rod plot, and 10 tons of stable manure. A little careful calculation will show that at this rate, at the present price of labour and manure, to say nothing of the other outgoings of cultivation, even £500 an acre for produce would not pay.

"The School Gardener." By J. Norris. xiii + 194 pp. 8vo. (Cassell, London [1919].) Limp covers, 2s. net.

This is a book partly for the teacher, partly for the pupil, and mainly practical in its nature, with little of the pedagogical side of the subject. The practical directions are, as in all really good books, clear and simple, and the illustrations are adequate, even profuse. Notes on pests accompany the descriptions of work to be done in the case of each crop, a chapter is devoted to garden friends, and another gives a calendar of operations. This is all admirable and very useful, but we cannot help wishing that it were all a little different, for we fear that at times school-gardening is apt to become an end in itself, and this is not as it should be. Its main place must be as a means to an end perhaps altogether apart from gardening—a means of education, and a very powerful means, too, when rightly directed, suitable to almost all children's requirements, even though they may never again be able to "garden." Such a garden may be and should be a great aid to development not only of body but of soul and spirit too.

"The Journal of Pomology." Edited by E. A. Bunyard, F.L.S. Published quarterly. 8vo. (Bunyard, Maidstone, 1920.) 10s. per annum.

We are very glad indeed to welcome this new addition to the annals of so important a branch of horticulture as fruit-growing, and we take the opportunity

of wishing it a large circulation, long life, and prosperity. The first part comprises 64 pp. large octavo, it is well and clearly printed, well illustrated, and has pages with ample margins. The contents are varied and include reprints of some important papers published elsewhere, reviews and abstracts as well as original papers.

We hope the re-printing of papers already published in accessible works will not be a main feature of the Journal, for there should be ample original matter from the many amateur and professional fruit-growers of the country to provide an excellent quarterly Journal of this alone. The frontispiece of the first number gives an excellent representation of the apple "Maidstone Favourite," and the description which accompanies it gives, as all fruit descriptions should do, full notes on the growth of the tree.

"Days in My Garden." By Ernest Ballard. Cr. 4to. xvi + 195 pp. (University Press, Cambridge, 1919.) £1 1s. net.

Do not think that this tells of the toil and labour of digging, of weary hours of work with the waterpot, of the planting of potatoes and the clearing away of cabbage stumps, or even of pricking out and stoking. These things doubtless, and many another, came in the author's days, but he was out to see Nature's work first and to appreciate it, not only under the guidance of man's hand but in wild Nature's own domain, by the stream, on the hillside, and in the valley. There, and here, and everywhere about, he saw things of beauty through the year and tells of what he saw as the months went by, and some of the thoughts they evoked, in pleasantly written passages illustrated by beautiful and beautifully reproduced photographs.

The beautifully clear type and lavishly ample margins of the book will appeal to the book-lover—who may nevertheless complain of the heavy glazed paper, but who assuredly will not complain of the illustrations or of the text. It would make a welcome gift to the book-lover who is also a Nature-lover.

"Problems of Fertilization." By F. R. Lillie. 8vo. xii + 270 pp. (University Press, Chicago, 1919.) \$1.75 net.

The main facts of fertilization are, of course, matters of common knowledge, but there remain many unsolved and little investigated problems concerning the details of the process. This excellent little book gives a clear statement of them and a lucid account of investigations into them so far as they have yet gone, most of the illustrations being drawn from the animal kingdom. The grouping of the matter is as follows: "The History of the Fertilization Problem;" "The Place of Fertilization in the Life-History;" "The Morphology of Fertilization;" "The Physiology of the Spermatozoon;" "The Physiology of Fertilization;" "The Problem of Specificity in Fertilization."

The book, which is one of the University of Chicago Science Series, is written not only for the specialist but also in such a way that the educated, without special knowledge, may read and comprehend.

"Storing Vegetables and Fruits: with chapters on drying in the oven and by the kitchen fire." By H. Cowley. 8vo. 32 pp. ("Country Life," London, 1918.) Paper covers, 9d. net.

This exceedingly useful little book contains not only advice upon the methods of storing all sorts of vegetables and fruits that are commonly grown in this country, but also recipes for the cooking of several of them. Particularly interesting is the account of the Burmese method of cooking beans, a method which should be tried by all who use these valuable vegetables. Only one remark in the book have we noticed from which we dissent, that to the effect that the Climbing Bean 'Tender and True' is nearly equivalent to the much-grown (and excellent) Continental 'Soissons à rames.' Except that they are both climbers, and both good to use as haricots, they are as unlike as French beans can well be. (See Report on Climbing Beans at Wisley, JOURNAL, R.H.S. xlv. p. 95.)

"Fossil Plants." By Prof. A. C. Seward. Vol. iv. 8vo. xvi + 543 pp. (University Press, Cambridge, 1919.) 21s. net.

Prof. Seward completes in this, his fourth volume, his interesting and valuable account of the plants the remains of which are found in a fossil form in various parts of the world, and brings the story up to include not a few of the vestiges of that ancient vegetation that have survived the slow changes and the cataclysms of the past until to-day. He is thus on ground more familiar to the ordinary

botanist, and to the catholic lover of plants though he be no botanist. This is not the place to attempt a critical review of this scholarly book; but we most cordially recommend it to the serious notice of all seekers after knowledge of the flora of the ancient world and its relation with the plants of the present.

"Flowering Trees and Shrubs for Use in South Africa." By T. R. Sim. 8vo. 200 pp. (Specialty Press, Johannesburg, 1919.) 7s. 6d.

With the growth of permanent settlements in South Africa the making of gardens is bound to advance, and we have in this annotated list one of the first attempts at a guide for the planter of trees and shrubs under South African conditions. Lists for various purposes are given in alphabetical order, and each plant is described with reference to a figure. Many are figured either by a drawing or by a photograph in the present work.

"Butterfly and Moth Collecting." By A. E. Hodge. 8vo. 128 pp.; 18 figs. 4 plates. (Pearson, London, 1919.) 2s. 6d. net.

This little book is intended as a young collector's guide to a fascinating hobby, and to supply a want in this subject, the alternative being to wade through scientific treatises which often tend quickly to damp the ardour of the amateur.

It is a pleasantly written and well worked-out book, dealing with every branch of the subject—equipment, how and what to collect, breeding in captivity, mounting, &c. In the Appendix is given a unique but unscientific key to the British butterflies, based upon size, outline of wings, and ground colour.

"Peach-Growing." By H. P. Gould. 8vo. 426 pp. (Macmillan, New York and London, 1918.) 10s. 6d. net.

To all peach-growers this book will be of great interest, although written for American readers, for it covers many sides. In America, where peach-growing is such an important industry, the varieties are grouped in sections in a most methodical style of classification, viz.:

Peen-to Race.—This race traces its origin to an importation of seed from Australia, made in 1869 by the late P. J. Berckmann, of Augusta, Georgia. From this collection of seed came a peach quite distinct from the others, and this Peen-to race is of special value in Florida and the Gulf Coast region.

South China Race.—This type originated in seed from China. One being specially good was named the 'Honey variety,' and was introduced about 1855 by Charles Downing, of New York, and like the Peen-to race it succeeds best in the warmer parts of America.

Spanish Race.—This race was introduced into Mexico from Spain by Catholic missionaries nearly 300 years ago, and apparently there are many varieties. It, like the other races named, seems to answer best in Texas and the Gulf States.

North China Cling Race.—This type was introduced by the late Charles Downing through Mr. Winchester, the British Consul at Shanghai, in 1850. This race seems to have very large fruit, and to be an important and popular type, hardier than some of the other races.

Persian Race.—It appears that this was imported from Persia to Italy about 1550, and to America about 1680. Many of the varieties grown in Britain belong to this group, and in America they are appreciated for their hardiness and good constitution. These different groups or races are distinguished by the forms of the stones or seeds, and will interest the British pomologist.

"Vegetable Forcing." By Ralph L. Watts. 8vo. 431 pp. (Orange Judd Co., New York, 1917.) 2\$.

This treatise was written for American readers, and will no doubt be valuable to them, but for British growers its chief merits will be the valuable instructions on how to deal with insect and fungus pests. These seem very practical and up to date. The American winters are on the whole more severe than we have here, which makes a considerable difference in practice. At the same time, anyone commencing this enterprise here would gain much useful information from its admirably printed, well written, and illustrated pages, that finish with an excellent index.

"The Principles and Practice of Pruning." By M. G. Kains. 8vo. 420 pp. (Orange Judd Co., New York, 1917.) 2\$.

We have read a number of books on American systems of pruning, &c., but we do not remember one so interesting or so clearly expressed as this, which is

written by Mr. M. G. Kains, Lecturer on Horticulture, Columbia University. Much of the matter would be of little value for the British reader, as, for instance, the pruning of Peaches, Nectarines, Grapes, &c., in the open; but even on these subjects there is a good deal of instructive matter that the grower of these fruits under glass in this country could read with benefit to himself. Many will not agree with a translation from Karl Koopmann: "The less a tree is cut the sounder it will be, and the better its fruits." Though the knife is indispensable in many cases, there is no question it is frequently used recklessly and does more harm than good, and is a source of disease and bad health to trees. On all sides we see instances of poor pruning by not making clean cuts, by the dead snags of branches, and holes right into the main branches or into the trunk itself, of trees that have had limbs cut improperly, and in a way impossible to heal over, an effort Nature always makes. The chapters on Pruning Principles, How Wounds Heal, and Prevention of Injuries, are worthy of the closest attention of all tree-lovers, and should receive far more study in the future than has been given in the past, in the case of both old and young trees. The illustrations are not only numerous, but capital guides on what to do and what not to do, if health and fertility are to be maintained, and planting, training, diseases, and tools most suitable to use are fully dealt with. In brief, it is a work that we can strongly recommend to all interested in this important matter. The book is excellently printed and well indexed.

"Heredity." By J. Arthur Thomson, M.A., LL.D. Ed. 3. 8vo. 627 pp. (Murray, London, 1919.) 15s. net.

The call for a new edition of this excellent work has enabled the author to correct a few errors, and to make a few slight alterations in the text.

"Profitable Herb Growing and Collecting." By A. B. Teetgen. Ed. 2. 8vo. xi + 195 pp. (Country Life, London, 1919.) 5s. net.

The war has turned the attention of many to the growing of medicinal plants, who before knew not that our main supplies were derived from the Continent. Since the war is happily at an end whether or not their cultivation will prove profitable here will depend upon the price for which the Continental senders can supply them. To everyone who essays to grow them we may, however, recommend this book with all confidence as a trustworthy guide, so long as he bears in mind that it was written with war conditions in view.

"Mendelism." By R. C. Punnett, F.R.S. Ed. 5. 8vo. xv + 219 pp. (Macmillan, London, 1919.) 7s. 6d. net.

First published in 1905, revised from time to time, and translated into German, Swedish, Russian, and Japanese, Professor Punnett's clear account of Mendelism, and gradual developments towards a complete solution of the problem of heredity, needs no other recommendation. This new edition contains two chapters additional to those which made the fourth edition, describing the American experiments on heredity in the fruit-fly, *Drosophila*. Not only the student, but the general reader who wishes to keep abreast of the work done in one of the most fascinating branches of natural history, will find a lucid exposition in this well-printed and illustrated book.

"The Flower and the Bee." By John H. Lovell. 8vo. 278 pp., 119 figs. (Constable, London, 1919.) 10s. 6d. net.

This book deals very completely with the value of insects in pollination, and is a modern popular edition of Hermann Mueller's "The Fertilization of Flowers." There are over a hundred photographs of American plants, showing the comparison between wind- and insect-pollinated flowers and their relation to insects.

Carl Vogt's, the German scientist, opinion is quoted, namely, "That the power and wealth of the English nation is due to bumble-bees, as they pollinate red clover, which is food for the famous English beef!"

Examples are given of bee, butterfly, hawk-moth, fly, and beetle-pollinated flowers, and the comparative value of anemophilous and entomophilous flowers, and the differences between pollen and nectar flowers are described.

The last chapter is devoted to the extreme importance of bees in fruit-growing.

"Forests, Woods, and Trees in Relation to Hygiene." By Augustine Henry, M.A., F.L.S., &c. 8vo. 314 pp. (Constable, London, 1919.) 18s. net.

Whether from a purely hygienic or from a commercial point of view, the afforestation of some of the water catchment areas of our country, which extend to fully 920,000 acres, is to be recommended, and will be sufficient reason for devoting fully three-fourths of this book to that important subject. Having, both in Wales and Scotland, had to deal with some of these catchment lands, we can fully substantiate the author's remarks which are clearly expressed, and we may rest assured that the tree-planting schemes which have been so successfully carried out by the Corporations of Liverpool, Manchester, and Birmingham are but precursors of other and more extensive works of the kind that are soon to follow.

As not a few of these watershed areas are on exposed, rough grounds at high altitudes, great care in the choice of suitable trees is necessary and several failures in the way of getting plantations established on such sites are directly due to want of discrimination in the species that were used. Some of those recommended in this book, such as *Abies nobilis* (the hemlock spruce), and *Cupressus macrocarpa* are only to be trusted in the most favoured situations; and even the Douglas fir we have found unsuited for wind-swept grounds, where it quickly loses its leading shoot and presents a meagre, miserable appearance. For sheltered dips it is a capital tree and grows rapidly, as at Cochwillan plantation, on Lord Penrhyn's estate at Bangor, where it is not however a pure crop, but was only added to fill up blanks in an old oak-wood. That ring or cup shake in Spanish Chestnut timber is due more to wind and less to frost is a generally accepted fact; while the most important uses to which hornbeam timber is applied are not included in dealing with the wood of that tree. The statement that ash can rarely be grown in a wood by itself requires some qualifying, as in Beds and Bucks some of the most profitable plantations are composed of pure ash.

The afforestation of pit-mounds is a valuable chapter that deserves re-reading, and the work of the Midland Re-Afforestation Association cannot be over-valued in its dealings with these barren and unsightly waste-heaps.

No less interesting is the chapter on Trees in Towns, though the author's note that the injurious effects of oiling and tarring the roads is not established hardly agrees with the observations of the reviewer and others who have studied the question in London and other large towns.

That *Paulownia imperialis* is unlikely ever to succeed in our towns is hardly supported by the magnificent specimen in Regent's Park, or that in the grounds of the Royal Botanic Society. Strange that the Turkey oak is not included amongst other members of its family, as it is by far the most dependable in London, where many giant specimens may be seen; neither is the Austrian or Corsican pine the best conifer for smoky towns, both being out-rivalled in that respect by the Eastern Thuya and *Prumnopitys elegans*, while the Maiden-hair tree has reached a goodly size in the foul air of Commercial Road.

Regarding the hybrid origin of the London plane about 260 years ago, we hope Professor Henry's remarks will not be taken too seriously. The advice on pruning town trees is sound and should be acted on, for, as the author wisely says, "the spectacle of untrained men going about hacking trees in towns is a painful but common one," and nowhere is this more in evidence than in the streets and squares of the great metropolis.

The sanitary influence of forests can hardly be overrated and is fully explained in the chapter under that heading, while "Parks in Towns and Municipal Forests" gives a brief but interesting account of the open spaces that have contributed so greatly in the matter of public hygiene.

Altogether "Forests, Woods, and Trees," which is divided into twelve chapters with forty-nine illustrations and extends to fully 300 pages, will be found an interesting and valuable addition to our forest literature.

"The Simple Carbohydrates and Glucosides." By E. Frankland Armstrong. Ed. 3. 8vo. x + 239 pp. (Longmans, Green & Co. London, 1919.) 12s. net.

No substances are more important than the carbohydrates in relation to the vital processes of the plant. They form the organic raw-material from which the plant derives the energy required for these processes and from which, together with the materials absorbed by the roots, it builds up in the laboratories of its cells the manifold constituents of its tissues. Moreover, the glucosides, which at one time were regarded as little more than waste or excretory products, are now constantly gaining in the importance attached to them, and there is little

doubt that they play a fundamental part in providing, in conjunction with their specific enzymes, a most delicate controlling mechanism for the various processes of plant metabolism. A thorough knowledge of the chemistry of these bodies is therefore indispensable to the advanced student of, and the research worker in, plant biochemistry and physiology.

The earlier editions of Dr. Armstrong's book are well known for the valuable survey they gave of this subject, and the edition now before us is thus assured of a warm welcome. In the seven years which have elapsed since the previous edition, much important work has been done, which has materially advanced our knowledge of the carbohydrates and glucosides. The new edition gives an excellent account of this work, and of the new ideas and fields for inquiry it opens out. It is especially gratifying to notice the recognition which is given to the sterling work of Irvine and his school. The plant biochemist will be particularly interested in the final chapter on the function of carbohydrates and glucosides in plants, from which he will obtain much inspiration, for it abounds in stimulating ideas for research. We were, however, surprised to notice that the author apparently still regards the anthocyanins as oxidation products of the flavones, notwithstanding the unquestionable evidence that is now available proving them to be reduction products of the latter. How this is to be reconciled with the almost equally unquestionable correlation which has been found between the distribution of oxidases and anthocyanins remains a matter for research.

Apart from this, we have nothing but praise for the admirable way in which the author has dealt with a subject which is at once one of the most fascinating and of the most intricate in the whole of chemistry. The volume easily maintains the high reputation deservedly attaching to the series of Monographs on Biochemistry of which it forms a part.

"A Course of Practical Chemistry for Agricultural Students." By H. A. D. Neville and L. F. Newman. Vol. ii., Part i. 8vo. 122 pp. (The University Press, Cambridge, 1919.) 5s. net.

This little book consists of a series of practical exercises in pure organic chemistry for agricultural students, and has been written primarily for the use of students taking the course for the degree in Agricultural Science at Cambridge. It therefore labours under the disadvantage of being written to cover a syllabus, which is bound to limit the general utility of a book, and to result in a certain inequality of treatment.

As pointed out in the preface, the notes which are appended to the practical directions for each day's work are intended "not to supersede lectures," but "to explain just the points . . . on which the student usually needs assistance . . . to explain the reasons and reactions of the experiments as they are being carried out." Although on the whole the directions and notes are tolerably clear, there are many mistakes, both of omission and commission, several of which are by no means unimportant, and which certainly do not fulfil the requirements of the above quotation. For example, the student is led to believe that the iodoform test is specific for ethyl alcohol (p. 24), and no mention is made of its being given also by acetaldehyde (p. 36) and acetone (p. 41). Again, it is stated that hydrolysed amygdalin reduces Fehling's solution on account of the benzaldehyde formed, the glucose produced being apparently neglected. There are other mistakes of this type, besides purely typographical errors which are also to be found. Altogether the book gives the impression of having been somewhat hastily compiled, and although it is doubtless of great value for the purpose for which it is primarily intended, it cannot be given an unqualified recommendation for general use. Lest the size of the book should be overestimated, it should be mentioned that of its 122 pages only 77 are occupied by the text, the remainder being left blank between the exercises for the student's notes.

"Introduction to Physical Chemistry." By James Walker. Ed. 8. 8vo. xiii + 433 pp. (Macmillan & Co. Ltd. London, 1919.) 16s. net.

Professor Walker's textbook is too well known to chemists to need any introduction. That in the twenty years since its first publication it should have passed through eight editions is sufficiently eloquent testimony.

The student of plant biochemistry who requires a thorough grounding in physical chemistry—a grounding which the modern trend of research in plant physiology makes all the more necessary—as well as the general scientific reader who requires a readable, accurate, and concise account of, for instance, the latest developments in molecular physics and radioactivity, cannot do better than turn to this new edition of an excellent book.

"Botany for Agricultural Students." By J. N. Martin. 8vo. x + 585 pp. (Chapman & Hall, London.) 12s. 6d. net.

This is a fairly complete elementary text-book of Botany, dealing with Heredity and Plant Breeding in the first two chapters. The examples and illustrations are taken, wherever possible, from plants well known in agriculture. The only other distinguishing feature of the book is that it begins with the study of the flower. This method has a good deal to recommend it, for it certainly tends to awaken interest at the outset by calling attention to some easily observed phenomena of plant life; the main drawback being the somewhat overloaded burden of technical terms which this branch of plant study is apt to carry.

Physiology naturally occupies a considerable portion of the book, and it is happily interwoven with the portions dealing with the structure of the organs concerned, so that the too frequent tendency to regard morphology, histology, and physiology as water-tight compartments of Botany is not likely to be fostered by the use of this book.

The illustrations are very useful, and an excellent feature of the book is the numerous references to bulletins, &c., giving full details of the matters alluded to in the text.

"The Planting, Cultivation, and Expression of Coco-nuts, Kernels, Cacao, and Edible Vegetable Oils and Seeds of Commerce; a Practical Handbook for Planters, Financiers, Scientists and others." By H. Osman Newland, F.R.Hist.S., &c., 8vo. vii + 111 pp. (Griffin, London, 1919.) 6s. net.

It is an unfortunate fact that most oil-producing plants require a warmer climate than that of England. It is true that flax thrives here, and sunflowers to a certain extent, and some varieties of Soya beans will give a crop, but, in the main, oil-producing plants are the products of warm temperate and tropical regions rather than those of cool temperate climates.

The demand for vegetable oils is unceasing and increasing, and as the plants which produce them as a rule produce other things of great commercial value as well, the area under these crops is constantly increasing—although up to now scarcely in the same ratio as the demand.

The title indicates the range of the present volume, although it does not by any means exhaust the list of plants the cultivation of which is dealt with. The numerous planters seeking profitable crops for their African estates especially may profitably consult it, and for all who are in any way interested in oil-bearing crops, the book will prove of the utmost value.

"Vegetable Growing." By J. G. Boyle. 8vo. 350 pp. (Lea & Febiger, Philadelphia and New York, 1917.) \$2.25 net.

This work is written by Mr. Boyle, Associate Professor of Horticulture in the Purdue University, Indiana, for American readers. Many of the subjects dealt with are quite unsuitable for cultivation in this country, and some that are always grown here under glass and for value as fruits only, e.g. the melon, are cultivated in America as vegetables as well as fruits. Climatic and other conditions are so different there from what they are here, that it would be a waste of time, labour, and money to attempt to grow some of the things mentioned in the book; also the author in some cases recommends an application of manure to the land at the rate of 50 tons to the acre, while we find a difficulty in getting any in many parts of this country. In respect to tools, appliances, and glass erections, it seems we are well up to date. At the same time there is a vast amount of information worth close attention by the home and market grower, and some significant figures are given concerning production—for instance, California tomato seed yielded 15.5 tons to the acre, while seed from Illinois produced 17 tons from the same variety, grown in exactly the same conditions, on plots of the same size. One of the reasons for this difference in results is attributed to the seed being grown in localities especially adapted to its production. Pests are described, and the best methods of dealing with them—a question to which a good deal of attention has been paid. The book contains over 150 illustrations, is well printed, and arranged in a very convenient form, and furnished with a capital index.

"The Management of English Woodlands." By W. F. Beddoes. 8vo. xix + 172 pp. (Simpkin, Marshall, London, 1919.) 7s. 6d. net.

Of the ten chapters into which this book is divided, one of the most important is that on Finance. The reasoning is sound and the conclusions arrived at as to profits are by no means overrated.

Though there is an amount of truth in the statement made by the author that

the English planter, who plants his woods with a view to the realization of a profit by the sale of the mature timber, must rely mainly on three trees only, larch, ash, and oak, not a few owners of woodlands will take exception to the remark. What about elm timber, which in the home output doubles in volume either the larch or ash, and for general usefulness is quite on a par with either? Beech grown on the Chiltern Hills and elsewhere finds a ready and remunerative market, and is probably suited for a greater number of constructive purposes than most other home-grown woods. Of course, as stated by the author, everything depends on soil and site; and certainly for the steep, wind-swept heights of the Scotch and Welsh mountains, our native Scotch pine is far ahead of the larch, and produces almost equally valuable timber. Probably, taking the country as a whole—England and Ireland in particular—the three trees mentioned by the writer would have first claim from a purely economic point of view. Much useful information is contained in the chapters on Planting and Thinning, and the well-thought-out remarks on fencing and its cost, and the distances at which forest trees should be planted both in upland and lowland situations, strike one as distinctly to the point. We cannot agree with the author that planting Scotch fir is not to be recommended, as the price is unremunerative and the tree is liable to be broken by the snow. On the contrary, no timber was found more useful during the last five years than this and the price (which went up to 1s. 4d. a foot cube) quite equalled that of the average-quality larch.

"Systematic Forestry" is a chapter that we would strongly recommend to be read by the advocate of a School of Forestry and Scientific Teaching in the woodlands. Academies and Professors are doubtless very useful; but it is possible to overestimate the advantage of the latter, as well as the inferiority of English compared with German woods.

"The real or supposed necessity of a knowledge of natural sciences is one of the most plausible reasons for the demand that afforestation must be entrusted to a Government Department whose officials are to be specially trained in a Government College." So writes the author, also that "there is no ground for the supposition that the scientific man should be the teacher and the practical man the pupil." British forestry has its faults and shortcomings, want of system in planting and felling being the most pronounced. Altogether, Mr. Beddoes' book contains a greater amount of sound reasoning than we generally find in works of the kind, and we find confidence in recommending a perusal of its 170 pages to all those who are interested in forestry—even to the practical forester or woods-manager.

"The Adventive Flora of Tweedside." By I. M. Hayward and G. C. Druce. xxxii + 206 pp. (Buncle, Arbroath, 1919.) 10s. *oid.* net.

The attempts of plants to secure a footing in a district to which they are not native are always interesting. At times they succeed in a remarkable fashion, and we have a fair number now which we have to regard as pernicious weeds, but which, a century ago, were unknown as such. It is part of the price we have to pay for increased facilities of communication and for extended sources of raw materials. Search around Galashiels has rewarded Miss Hayward with nearly 350 aliens mainly brought in wool, and it will be interesting to see a generation hence how many of these have succeeded in establishing themselves permanently in the area.

"The Soil." By Sir A. D. Hall. Ed. 3. 8vo. xv + 352 pp. (Murray, London, 1920.) 7s. *oid.* net.

No book on the soil can rival this as an introduction to a study of its subject, or as a book of reference for the intelligent cultivator of farm or garden. Its learned author has had unrivalled opportunities of becoming acquainted at first hand with the many problems with which it deals, and he has used them to good purpose, and at the same time has brought all his powers of lucid exposition to bear in producing this excellent account of the present state of knowledge concerning the fundamental source of all wealth.

"The Calendar of Garden Operations." By the Staff of the "Gardeners' Chronicle." New ed. 8vo. 174 pp. ("Gard. Chron.," London, 1920.) Linen covers, 2s. net.

There is no better Calendar than this; no better guide to the timely performance of garden operations in small and medium-sized gardens; and the new features in this edition increase its value. The book is too well known (for it has been used seventy-eight years) to need any description, and we recommend its purchase to all gardeners even at the enhanced price the times have necessitated.

"The Soil and its Care." By Mrs. M. Grieve, F.R.H.S. 8vo. 77 pp. (The Author, Chalfont St. Peter [1920].) Paper covers, 2s. net.

This little book contains a mass of notes upon soil, soil treatment, manures, and their uses for different soils and crops. It may be consulted with advantage by all beginners wishing for information upon the material which is their chief source of profit and pleasure.

"The Science and Practice of Manuring." By W. Dyke. New ed. 12mo. xxxvi + 157 pp. (Lockwood Press, London, 1920.) Stiff covers, 2s. net.

We commented favourably upon this excellent little book when it first appeared, and we are sure that any who possess and consult it in its new form will find in it a safe guide in many of the difficulties with which they are confronted.

"Roses, their History, Development, and Cultivation." By the Rev. J. H. Pemberton. 2nd ed. 8vo. 334 pp. (Longmans, London, 1920.) 15s. net.

Mr. Pemberton has brought out a second edition to his well-known book on Roses, published eight years ago, in which he substantially follows the lines of the first edition. It will be remembered that the first half of the book contains a popular description of the species of roses and their garden hybrids, while the second half deals with the cultivation of the Rose, the book concluding with a selection and short description of the varieties which the author recommends for cultivation.

The principal alterations we have noticed in the second edition consist in the addition of a couple of paragraphs descriptive of perpetual-flowering Musk Roses, a class on which the author has himself been working with conspicuous success, and another on the hybrid Lutea, introduced by M. Pernet Ducher. Comparatively small alterations occur in the author's description of soil treatment, and the revision of the selected list has led to numerous omissions from, and additions to, the former list.

In the author's observations on the Soil and its Treatment, though it may be that the author has not fully described the effect of modern research on the chemistry and bacteriology of changes in the soil, this is of less importance in a work of this character than in a purely scientific work, seeing that the average gardener wishes rather to know what to do than exactly what happens when he does it, and the author's general directions are sound, as might be expected from one of his experience.

He still adheres, however, to his view that in making a rose bed the manure to be added must be placed at the bottom. If his directions are strictly followed this may be satisfactory, or, at worst, a waste of manure to a greater or less extent, for he insists on free drainage. In many suburban gardens, however, free drainage is not available, and the deep burial of manure in water-logged land may result in the production of poisonous nitrites instead of the beneficial decomposition which occurs in well-aerated soil. There may be something of safety perhaps in the almost universal practice of pricking manure into the beds between the plants in early spring, though nowadays one must add "when we can get it."

The experience of those of us who, during the war, turned some of our rose beds to the growing of vegetables, has established that roses are far from being the most fastidious of garden plants.

Mr. Pemberton's book has secured a position as an authority on roses and is valued by all rosarians who possess it.

"Henry Nicholson Ellacombe. A Memoir." Edited by Arthur W. Hill. 8vo. 318 pp. ("Country Life," London, 1919.)

As half a loaf is better than no bread, we must be thankful to have this excellent memoir of Canon Ellacombe, however much we should like a fuller life and letters of so remarkable a man. His many-sided interests, marvellous memory, and simply astonishing activity never failed until within a few weeks of the end of his long life of almost 94 years. He inherited from his father the love of beautiful and interesting things, and also the power to select and hold by the very best. It is not surprising that in his ripe old age he was surrounded by collections of plants and art treasures that attracted admiring connoisseurs from the ends of the earth. His kind and generous spirit, readiness to impart of his knowledge, and genial hospitable habits created an atmosphere at Bitton Vicarage that will always be remembered with thankfulness by those who entered it. To such, this book is a precious heritage, opening again the closed door of the happy past; and to all who can appreciate the "delight in simple things" it should prove a help and encouragement.

The character and characteristics of "the Canon" stand out clearly in its

pages, for the editor has very deftly pieced together his own recollections and those gathered from other friends, as well as terse, witty extracts from letters, five reprinted articles and one sermon, to show us the greatness and goodness of the Canon's mind and heart, and to make us long for more.

Again, all who love a garden should read, rejoice in, and lay to heart the gardening methods and generosity revealed in many of the chapters, especially that by Mr. Bean on the "Bitton Garden" and Miss Willmott's "Canon Ellacombe and his Plants." There must have been very few good plants capable of being grown in the open air in any part of England that had not at some time been tried at Bitton, and, save for those that could not tolerate a soil impregnated with lime, most of those that entered that peaceful enclosure remained there and delighted all who saw them season by season. Not infrequently he would point to a healthy clump of some plant and say "My father planted it there." The congestion of the beds would have been terrible had it not been the Canon's rule to give away half of any plant to any who would appreciate it, as soon as it was divisible. Thus, quite half the gardens of England must be directly indebted to Bitton for many of their greatest treasures, and perhaps the other half indirectly. Of course there was much exchange of good things, but an extract from one of his letters will show it was the pleasure of distributing rather than the exchange that lay at the foundation of the practice.

"If you ever say you are in debt to Bitton I will not speak to you again. If I give a friend 100 plants and he gives me one, I thank him for his one, but I don't enter him as my debtor for ninety-nine."

He enjoyed finding a good form of a plant, whether in a friend's garden or on the wild hills, he enjoyed growing it and showing it to friends, but most of all he enjoyed sharing it with those who entered into his enjoyment of it.

His knowledge of gardening books, old and new, and of the best gardeners and their gardens during so long a period, made him a fountain-head of wisdom. Much evidence of this is to be found in this memoir, and will prove a constant reminder and stimulant to those who knew him and try to carry on his good work; and it is much to be hoped will instil into younger gardeners for many years to come the great principles that made Bitton Garden so pleasant and famous, and taught so many to grow plants for their own intrinsic beauty and interest, rather than as mere sources of colour to be worked into schemes and to be viewed from a distance.

"An Introduction to the Study of Landscape Design." By Henry Vincent Hubbard and Theodora Kimball. 4to. 406 pp. (Macmillan, New York, 1917.) 25s. net

The fine library at the command of the authors has offered them exceptional advantages for consulting every recognized authority on what is called Landscape Architecture in the United States. Their study of the classics has been conducted with great industry and excellent judgment, and the authors have justified their aim of offering a serious contribution to the literature of Landscape and Garden Art.

Lest there should be the suspicion of left-handed compliment to work we desire to praise, we may add that one does not expect at this day to discover new principles of first importance in any fresh volume on the subject. As in the case of this book, one is happy to find accepted theories explained clearly and illuminated by original ideas in detail.

The authors have taken great pains to justify and illustrate every opinion put forward, and have brought to their task plenty of fresh thinking.

Some space is devoted to the elaboration of points which are fairly elementary to English gardeners and lovers of landscape beauty. The work, however, is intended primarily as a text-book for American students and readers, among whom it is assumed that the gardening sense has not yet been fully developed.

The method of the authors has been to select and summarize those artistic theories on the subject of gardening (in the broadest sense) which are best capable of general application.

The conclusions arrived at are so much in accord with modern English ideas that there is little, if anything, left to the reviewers but to recommend the book to students of the art in this country.

The chapters on psychological influences, taste, and ideals, and on the character of landscape and composition, are specially to be commended, inasmuch as they refer sympathetically to universal principles which must be fully appreciated by the landscape gardener who takes his art seriously, and wishes his work to live after him.

Insistence on the broader aspects of garden and landscape design is desirable

in these days of specialization when the larger pictures are liable to be forgotten in the absorbing interest of detail.

The pictorial illustrations have been chosen chiefly to show points which cannot be so well expressed in words, and with special reference to good composition in various modes. The subjects chosen are generally familiar, but serve their purpose the more efficiently on that account. We are very anxious, however, to see a representative selection of examples of the best work in the great American gardens—such as writers on gardening in this country are so freely permitted to utilize.

"Gardens of Celebrities, and Celebrated Gardens, in and around London." By Jessie MacGregor. Large 8vo. 326 pp. (Hutchinson, London, 1919.) 25s. net.

A delightful book which, ostensibly describing the gardens of London and Greater London, in reality leads the reader along the paths of history, poetry, and anecdote; and delicate portraying of the charm of old-fashioned gardens and stately homes enlivens the route, while historical details are brought out in most interesting fashion. It is difficult to realize that Marlborough House now stands on the grounds formerly belonging to a religious house—with a hospital for "fourteen deserving maidens, all lepers," where St. James's Palace now stands. These were turned out by Henry VIII, who made the land into a nursery for deer, Marlborough House itself being built by Christopher Wren about 1710.

Lambeth and Fulham Palaces, Sion and Holland House, all are described with much charm; and information never before given in so readable a form will make this book welcomed by all classes of readers, while the houses of the great nobles are pictured in all their glory the smaller houses (such as Hogarth House and Walpole House) have their portraits skilfully painted in pencil, words, and brush.

The paintings of "The Tudor Gateway, Lambeth," and the "Inigo Jones Gateway, Chiswick," are perhaps the most successful in the collection, the others being rather deficient in the cool tones of blue and grey so needed in garden paintings. Doubtless the colour process used is responsible for this.

"Beautiful Flowering Shrubs." By G. Clarke Nuttall, with col. ill. by H. Essenhigh Corke. Large 8vo. xii + 280 pp. (Waverley Book Co., London, [1920]). 40s. net.

It is true, unaccountably true, that flowering shrubs have not yet come to their own in the garden. Such a spring as the present has emphasized their value, even to those who thought they knew it. Sweet scent, bright flower, beautiful habit, pleasant autumn tints, winter pictures, relief from sameness if wisely used, all these we may get from flowering shrubs. A good number of them, mainly the better known and well-proved varieties, are dealt with in this volume, and forty pictures from colour-photographs are included, and round them the interesting, instructive, and accurate text is gathered. The type is excellent, the proof-reading generally good—a few names are misspelt (*e.g.*, more than once the misnomer *Rhododendron flavium* occurs, once *Embothreum*, two or three times *Grevillia*, and so on)—the format pleasing, the index full, and the illustrations (like the price) above the average of what one expects to find in a popular book. It is one we can heartily commend to the owner of the medium garden.

"Beginner's Bee Book." By F. C. Pellett. 8vo. 179 pp. (Lippincott, Philadelphia and London, 1919.) 5s. net.

A delightful book, with no long tedious chapters of the anatomy of bees, but full of practical hints and methods telling of the attraction of bee-keeping, how to begin, and how to extend. Where poultry have to be fed every day at great cost, bees require feeding very rarely if at all, while one hive will produce up to 100 lb. of surplus honey. The brief life history of bees, of queens, workers, and drones, is so clearly written that all is easy to apprehend. The method followed in the States, of tiering up bars for extraction and sections for comb honey, is the same as beekeepers follow in this country, always adding the new comb beneath the partly full and immediately over the brood nest. How to produce a surplus and to sell it in the best market is taught in this "Beginner's Bee Book."

The chapters on food for bees shows difference from this country in that the author writes of superiority of sweet clover (*Medicago*) and alfalfa (*Lucerne*). In this country these crops are cut in upland pastures, and all stock feeds them off; they cannot flower again, so are useless as a honey crop; as forage crop they must be cut early or they become sticky and hard. There is too little good land here to leave them entirely for bees; we have tried it.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
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 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.
 Wilson, G. F.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales . . .	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope . . .	Agr. Jour. Cape G.H.
American Journal of Botany . . .	Amer. Jour. Bot.
Annales Agronomiques . . .	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault . . .	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort. . .	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles . . .	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg . . .	Ann. Jard. Bot. Buit.
Annals of Applied Biology . . .	Ann. Appl. Biol.
Annals of Botany . . .	Ann. Bot.
Annual Report Agricultural Research Station, Long Ashton . . .	Ann. Rep. Agr. Res. Stn., Long Ashton.
Beiheft zum Botanischen Centralblatt. . .	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura . . .	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Brotaniana . . .	Bol. Soc. Brot.
Bollettino della R. Società Toscana d'Orticoltura . . .	Boll. R. Soc. Tosc. Ort.
Botanical Gazette . . .	Bot. Gaz.
Botanical Magazine . . .	Bot. Mag.
Bulletin de la Société Botanique de France . . .	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret . . .	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France . . .	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane . . .	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne . . .	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica . . .	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad . . .	Bull. Bot. Dep. Trin.
Canadian Reports, Guelph and Ontario Stations . . .	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie . . .	Cent. f. Bact.
Chronique Orchidéeenne . . .	Chron. Orch.
Comptes Rendus . . .	Comp. Rend.
Contributions from U.S.A. Herbarium . . .	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria . . .	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand . . .	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées . . .	Dict. Icon. Orch.
Die Gartenwelt . . .	Die Gart.
Engler's Botanische Jahrbücher . . .	Eng. Bot. Jah.
Gardeners' Chronicle . . .	Gard. Chron.
Gartenflora . . .	Gartenflora.
Journal de la Société Nationale d'Horticulture de France . . .	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agriculture, Victoria . . .	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies . . .	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Research . . .	Jour. Agr. Res.
Journal of Agricultural Science . . .	Jour. Agr. Sci.
Journal of Botany . . .	Jour. Bot.
Journal of Chemical Society . . .	Jour. Chem. Soc.
Journal of Ecology . . .	Jour. Ecol.
Journal of Economic Biology . . .	Jour. Econ. Biol.
Journal of Economic Entomology . . .	Jour. Econ. Entom.
Journal of Genetics . . .	Jour. Gen.
Journal of the Board of Agriculture . . .	Jour. Bd. Agr.
Journal of the Linnean Society . . .	Jour. Linn. Soc.
Journal of the Royal Agricultural Society . . .	Jour. R.A.S.
Journal of the Society of Chemical Industry . . .	Jour. Soc. Chem. Ind.

Journals, &c.	Abbreviated title.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Elütenpflanzen Mitteleuropas	Lebens. d. Blütenpfl.
Mycologia	Mycologia.
Naturwiss. Zeitschrift Land und Forst.	Nat. Zeit. Land-Forst.
New Phytologist	New Phyt.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Report of the Botanical Office, British Columbia .	Rep. Bot. Off. Brit. Col.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Gard.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scot. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

After-Ripening and Germination of Seeds of *Tilia*, *Sambucus*, and *Rubus*. By R. C. Rose (*Bot. Gaz.* vol. lxvii., No. 4, April 1919, pp. 281-308).—"Air-dry seeds of *Tilia americana*, *Sambucus canadensis*, and *Rubus Idaeus* do not germinate when placed in a moist substratum at room temperature. In no case does water absorption seem to be the limiting factor. Air-dry seeds planted in the soil over winter give low percentages of germination."

In the case of *Tilia*, "seed coats are not the cause of dormancy, although they may serve to lengthen the dormant period. A state of dormancy exists in the endosperm or embryo, or both."

"Seeds with coats removed after-ripen at temperatures slightly above freezing. From 0°-2° C. seeds after-ripen, but do not germinate. Above this temperature both processes may occur."

"With *Sambucus* as high as 77 per cent. of germination was obtained by layering fresh seeds out of doors over winter, but no satisfactory forcing agent has yet been found."

"Dormancy in *Rubus* is probably due to the high breaking strength of the endocarp. Seeds treated with concentrated sulphuric acid for two hours, then thoroughly washed, germinate readily on cotton, filter paper, or quartz sand."

"The optimum temperature for germination lies between 20° and 25° C. Seeds germinate equally well in light or darkness. Naked seeds germinate poorly in soil, probably on account of the action of bacteria and fungi."

A practical method for the germination of *Rubus* seeds, apart from layering, is described. This method is based upon the action of concentrated sulphuric acid.—R. J. L.

Amaranthus: Chemical Constituents of *Amaranthus retroflexus*. By M. L. Woo (*Bot. Gaz.* vol. lxviii., No. 5, Nov. 1919, pp. 313-344; with 11 figs.).—The investigations described in this paper were carried out primarily to find whether *Amaranthus* stores nitrogen in the form of nitrates, as has been contended. It is quite apparent that a weed would become a formidable rival of cultivated plants by withdrawing the nitrogen from the soil.

It was found that there is a large amount of nitrogen in *Amaranthus*, stored principally in the stem and branches. "The rate of nitrate absorption increases with the aging of the plant, perhaps being partly due to the development of the root system, with numerous branching rootlets increasing the radius of the feeding area from a few inches to two feet or more."

"The carbohydrates and nitrogen compounds fluctuate throughout the growing period. In general, when the carbohydrates are high, the nitrogen compounds are low, and vice versa."—R. J. L.

American Blight. By A. Magnien (*Rev. Hort.* vol. xci. p. 371).—To protect fruit-trees from American blight, surround the stems with manure in October and brush the affected parts with paraffin emulsion.

Or spray with water at 80° C. containing 1 per cent. nicotine and sodium carbonate.—S. E. W.

Amylase, Secretion of Amylase by Plant Roots. By L. Knudson and R. S. Smith (*Bot. Gaz.* vol. lxviii., No. 6, Dec. 1919, pp. 460-466; with 2 figs.).—In culture experiments conducted with *Zea Mays* L. and *Pisum arvense* L., it was found that the roots were unable to utilize soluble starch, and there was no appreciable secretion of the enzyme amylase.—R. J. L.

Aphis-feeding Ladybird (*Bull. State Comm. Hort., California*, viii. 2, Feb. 1919; 22 figs.).—Among other items of interest contained in this bulletin is an account of the work of distributing colonies of the aphis-feeding ladybird (*Hippodamia convergens*) to the farmers and fruit-growers of the State. During the season about 75,000,000 of these insects were shipped from the insectary, mainly to the Imperial Valley, for use of grain and cantaloupe growers.—V. G. J.

Apple, Bitter-Rot of, and Sources of Infection. By J. W. Roberts (*U.S.A. Bur. Pl. Industry, Bull.* 684, pp. 1-24; 5 figs.).—The bitter-rot in apples is caused by the fungus *Glomerella cingulata*, and is widely distributed throughout the States. The fungi can survive the winter in the host-plant, and these serve as sources of infection for the following year's crop. These sources are as follows:

- (a) *Mummy Apples*: The fungus can live only one year in these apples.
- (b) *Cankers on stem*: The fungus may live for several years on an old canker.
- (c) *Leaves*: It is stated that the fungus may be found on the leaves.
- (d) Other host-plants besides the apples help to enable the fungus to survive the winter months.

The spores are scattered by rain, dew, insects, and possibly birds. Varieties differ as to susceptibility to the disease.

The removal of mummy apples and cankers, with spraying, is an efficient control measure, and is recommended.—A. B.

Apple, Black Spot. By W. Laidlaw and C. C. Brittlebank (*Jour. Agr. Vict.* Aug. 1918, pp. 484).—Three different brands of lime sulphur were used, each giving equally good results, costing in material 3d. a tree. The best time for the first spray is when more green than pink is seen; the second spraying when the centre flowers of cluster are fully open. Result obtained from lime sulphur was much better than from Bordeaux, 6-4-40; the foliage looked healthier and remained longer on the trees; the skin of the fruit had a better colour, and was clearer and sappier-looking. It is desirable to have all the cultivation done before spraying is commenced, as the resting spores developed in the fallen diseased leaves of the previous season reach maturity at the time the apple and pear are coming into bloom; under favourable conditions these are blown in countless numbers, and are carried by air currents up to the young leaves and fruits, where they germinate and infect the crop. Cultivation should not be resumed till all danger of infection is past. The results in clean, slightly spotted, and unmarketable are in each case given. First spray, 1 in 12, or 1 in 15; second spraying, 1 in 30 or 35.—C. H. H.

Apple-Bud Selection: Apple Seedlings from Selected Trees. By C. S. Crandall (*U.S.A. Exp. Sta. Illinois, Bull.* 211, June 1918; 43 figs.).—An attempt to discover whether there are differences in value for purposes of propagation between large buds and small buds, between those produced on different parts of the tree, and between those from different locations on the shoot. So far as growth of trees is concerned, all buds from healthy shoots have been found to be of equal value, and small scions have given as good results as stout ones. Fruiting results are now being watched.—A. P.

Apple Bug, The Green, in Nova Scotia. By W. H. Brittain (*Dep. Agr. N.S., Bull.* 8, pp. 5-56; 11 plates).—This paper contains a very complete history with control measures of *Lygus communis* var. *novascotiensis*, Knight, a serious pest in apple, pear, and quince orchards.

This insect is the forerunner of canker, and many trees are menaced by these two pests. A very full description is given of the egg, nymphs in their several stages, and imago. The most successful spray was nicotine sulphate, $\frac{1}{4}$ pint to 100 gals. water, in two applications—(1) just before the blossoms open and (2) after the blossoms have fallen. It must be applied in a driving, powerful spray.

Grease-banding in conjunction with spraying is urged to catch the dislodged nymphs returning to the tree.—G. F. W.

Apple Culture under Irrigation in Victoria. By J. Farrell (*Jour. Agr. Vict.* June 1918, pp. 355-363, and August, pp. 454-462; illustrated).—C. H. H.

Apple Maggot, The. By W. H. Brittain and C. A. Good (*Dep. Agr. N.S., Bull.* 9, Jan. 1917, pp. 3-70; 7 plates).—This native species, *Rhagoletis pomonella*, Walsh, is here reviewed with life history, natural enemies, control measures, and a bibliography. It is a pest of small orchards, where spraying is seldom done.

The eggs are laid beneath the skin of the fruit, and the larvæ, on emerging, tunnel the fruit in all directions.

Picking up and destroying the fruit is an excellent remedy, but it is cheaper to spray with lead arsenate, 2 lb. to 40 gals. water when the flies first appear, which is about the middle of July, and again a fortnight later.—G. F. W.

Apple, Powdery Mildew of, and its Control. By D. F. Fisher (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 712, Oct. 1918, pp. 1-28; 3 plates).—The mildew is generally prevalent in the arid regions of the Pacific North West, where sometimes more than 50 per cent. of the crops are attacked. The causal organism (*Podosphaera leucotricha* (E. and E.) Salm.) winters in dormant buds as mycelium, is spread by wind-carried conidia, and can readily germinate upon leaves and buds and fruit. The disease is controlled by sulphur sprays during the growing season. Bordeaux mixture is less effective than sulphur sprays. It is suggested that three applications should be applied during the season.—*A. B.*

Apple Scald. By Chas. Brooks, J. S. Cooley, and D. F. Fisher (*U.S.A. Jour. Agr. Res.* xvi. No. 8, Feb. 1919; pp. 195-217).—It is found that well-matured apples are much less susceptible to scald than immature ones, and that apples from heavily irrigated trees scald worse than those from trees receiving more moderate irrigation. The scalding does not take place at 25°-30° C. Scald is considerably reduced by decreasing the humidity, while 1 per cent. to 6 per cent. carbon dioxide tends to prevent it. Apples susceptible to scald have been made immune by storing for a few days in carbon dioxide gas. A constant air movement of $\frac{1}{2}$ to $\frac{1}{4}$ mile an hour practically prevents apple scald. Apples packed in boxes or ventilated barrels scald much less than those in tight barrels. It is supposed that apple scald is due to volatile or gaseous substances other than carbon dioxide that are produced in the metabolism of the apple, and these substances can be carried away by air currents or removed by various absorbents.—*A. B.*

Apples, Cost of Producing, in Western Colorado. By S. M. Thomson and G. H. Miller (*U.S.A. Dep. Agr., Bull.* 500, March 1917; 10 figs.).—A detailed study made in 1914-15 on 125 fruit farms. Similar studies have been made in Flood River Valley (*Bull.* 518), and Payette Valley, Idaho (*Bull.* 636).—*A. P.*

Apples, Seed Production in. By Charles S. Crandall (*U.S.A. Exp. Stn., Illinois, Bull.* 203, August 1917, 8 figs.).—Over 30,000 fruits were examined, and it was found that seed production in large fruits exceeded that in small, and was nearly twice that recorded for crab fruits. Control of pollination showed no marked influence on the number of seeds developed. A small test was made of fruits having no developed seeds (parthenocarpic), and they were found to exceed in weight an equal number of fruits selected at random which were highly productive of seeds. Certain varieties exhibited a strong tendency to multiplication of seeds, large Shockley fruits averaging fifteen seeds each as against the full complement of ten in a normal fruit.—*A. P.*

Araliaceae. By R. Viguier (*Rev. Hort.* vol. xci. pp. 228, 229, 250-252).—With the exception of the Ivies the Araliaceae are exotic. They are cultivated for their foliage, as their flowers are insignificant. They may be classified according to the shape of their leaves: (1) simple leaves, (2) palmate leaves, (3) pinnate leaves.—*S. E. W.*

Arsenate of Lime. By G. E. Sanders (*Dep. Agr. Canada, Crop Protection Leaflet* 10).—Arsenate of lime or calcium arsenate is recommended on grounds of economy in cost for spraying apple, pear, and potato, and to supersede lead arsenate, but it is not safe on tender foliage trees as cherry, peach, or plum.

If used by itself, a yellowing and often burning of the foliage results, but in conjunction with the following the results are promising.

1. Bordeaux mixture—1 lb. of calcium arsenate to 40 gals. Bordeaux mixture.

2. Lime-sulphur— $\frac{3}{4}$ lb. of calcium arsenate to 40 gals. lime sulphur, with 5 lb. of hydrated lime added.

3. Sulphide washes— $\frac{1}{2}$ lb. of calcium arsenate to 40 gals. sulphide wash, with 10 lb. of hydrated lime added.—*G. F. W.*

Asparagus. By H. C. Thompson (*U.S.A. Dep. Agr., Farm. Bull.* 829, pp. 1-20; 10 figs.).—In preparing the soil for asparagus, plough in 20-40 tons of farmyard manure an acre. Every year, at the end of the cutting season, apply 1,000-1,500 lb. an acre of a fertilizer containing 2-4 per cent. of nitrogen, 6-8 per cent. of phosphoric acid, and 6-8 per cent. of potash, preferably in the form of potassium chloride or kainit.

'Reading Giant,' 'Argenteuil,' and 'Palmetto' are rust-resisting varieties.

For canning, blanch the shoots by immersion in boiling water, then plunge into cold water; arrange in cans or jars, tips up, cover with brine containing

4 oz. of salt to the gallon. The vessels are placed for three minutes in boiling water, removed to close the openings. The cans or jars are then again heated for two hours.—S. E. W.

Asparagus: Root Rot. By H. Blin (*Rev. Hort.* vol. xci. pp. 325, 326; 1 fig.).—Asparagus attacked by *Rhizoctonia violacea* should be isolated by digging a trench round the diseased plants. The soil must be thrown inside the circle. The asparagus plants are dug up, saturated with petroleum, and burnt. The soil is disinfected by injecting carbon bi-sulphide 4 oz., or formalin 2 oz., to the square yard. Good results are also obtained by removing the surface soil and copiously watering with a 0.3 per cent. solution of potassium sulphocarbonate. The following year sprinkle the soil with the same solution before earthing up. After either of these methods, the soil requires nitrogenous manure.

In non-calcareous soils watering with strong solutions of ferrous sulphate (3 oz. per square yard) is efficacious.—S. E. W.

Barberry Destruction. By E. C. Stakman (*U.S.A. Dep. Agr., Bur. Pl. Ind., Farm. Bull.* 1058, May 1919, 12 pages; 5 figs.).—This bulletin deals with the great necessity of a campaign for the eradication of the common barberry (*Berberis vulgaris*), because it forms an intermediate host for the rust of wheat disease. The Department of Agriculture is co-operating with thirteen States in the Upper Mississippi Valley in the destruction of all the bushes of the common barberry in this region. The differences between the Japanese barberry, which does not carry the rust, and the common barberry are shown by diagrams. In addition, the destruction of the Oregon grape bush (*Mahonia* sp.) is advocated.—A. B.

Bidens, Studies in the Genus. By Earl E. Sherff (*Bot. Gaz.* vol. lxiv. No. 1, July 1917; pp. 21-41; 2 plates).—Ten new species of *Bidens* are described in detail. These are composite herbs (Heliantheae), with inconspicuous inflorescences.—R. J. L.

Blister Canker of Apple Trees: A Physiological and Chemical Study. By Dean H. Rose (*Bot. Gaz.* vol. lxvii., No. 2, Feb. 1919, pp. 105-146; with 10 graphs).—In this paper are given the results of a physiological study of the disease known as Illinois or blister canker, which is caused by *Nummularia discretu* (Schw.) Tul. "Microchemical tests indicate, for diseased bark, a partial disintegration of cellulose, a disappearance of cyanogenic glucoside, and a lower content of starch, calcium oxalate, and tannins.

"Macrochemical analyses show that diseased bark has a higher percentage of dry matter, lipoids, alcohol-water-insoluble residue, and total nitrogen, but a lower percentage of alcohol-water-soluble material than healthy bark. The percentage of carbohydrates in both tissues seems to be about the same. Differences of tannin content are definite but not large. Sound healthy bark contains more than diseased bark, and diseased bark more than dead bark, from the surface of the canker."

Diseased bark shows a greater oxidase activity. This is probably due to the combined activity of the oxidases of fungus and host, lower acidity, and possibly to a greater degree of dispersion of the oxidizing agent. The lower tannin content of diseased bark may also be a contributing factor.—R. J. L.

Bog Water: Colloidal Properties of Bog Water. By George B. Rigg and T. G. Thompson (*Bot. Gaz.* vol. lxviii. No. 5, Nov. 1919, pp. 367-379).—"It seems clear that the substances in bog water that are precipitated by electrolytes, and on long standing without electrolytes, and will not dialyse through parchment paper, and although present in considerable quantities, do not appreciably lower the freezing-point of water, are in a colloidal state. Since bog water and preparations from it (for example, the concentrate and the solution of the residue from evaporation) which contain these substances are toxic to *Tradescantia* cuttings, while preparations that do not contain them (the distillate) are non-toxic, it appears that the toxicity is associated with the matter that is in a colloidal state."

"The oxidation of the toxic matter to non-toxic matter seems to be a basis of agricultural practice in bringing bog lands into cultivation."—R. J. L.

Cabbage, Diseases of. By L. L. Harter and L. R. Jones (*U.S.A. Bur. Pl. Industry, Farm. Bull.* 925, Jan. 1918).—Generally speaking, the diseases of the cabbage are best controlled by suitable rotation of crops and the destruction of cruciferous weeds (mustard, charlock, shepherd's purse) in the neighbourhood.

Club-root is prevented by use of lime. Disinfection of seed is useful in preventing black-rot and black-leg. Drainage water and refuse from infected plants is a fruitful cause of disease.—A. B.

Cell Sap: Relation of Nutrient Solution to Composition and Reaction of Cell Sap of Barley. By D. R. Hoagland (*Bot. Gaz.* vol. lxviii. No. 4, Oct. 1919, pp. 297-304).—"The expressed sap from barley plants grown in water, sand, and soil cultures under controlled conditions, has been examined, with the following results:

"1. The osmotic pressure in the sand and water cultures are reflected in the cell sap of the tops and roots.

"2. The electrical conductivity of the nutrient solution has a marked influence on the conductivity of the sap. This is as marked for the tops as for the roots. The conductivity of the plant sap is from four to fifty times greater than that of the nutrient solution.

"3. The sap from the tops of all plants grown in sand and soil cultures, or water cultures of different concentrations and reactions had almost the same P_H value, approximately 6.0.

"4. Samples of sap from plants grown on six different soils under the same climatic conditions were analysed for important elements. In every case the concentration in the sap was found to be very much greater than in the soil solution.

"5. The dynamic nature of the relation between the soil solution and the plant is emphasized."—R. J. L.

Cherry Leaf Spot Disease Control. By J. W. Roberts and L. Pierce (*U.S.A. Dep. Agr., Farm. Bull.* 1053; 7 pp.).—The leaf spot of the cherry injures both sweet and sour varieties of this fruit in many of the Eastern States. The disease is caused by a fungus which attacks the leaves, causing them to become "shot-holed." The fungus reproduces by ascospores and conidia.

The best control measure is by spraying with a diluted lime sulphur solution or with Bordeaux mixture when the petals fall, when the fruit is maturing, and when the fruit has been picked.—A. B.

Chinese Plants, New. *Arbores Fruticesque Chineses Novi* III. By Camillo Schneider (*Bot. Gaz.* vol. lxiv. No. 1, July 1917; pp. 70-78).—The author describes the following new species and varieties:

- (1) *Cotoneaster* (sect. *Chaenopetalum* Koeh.) *oligocarpa*, n. sp.
- (2) *C.* (sect. *Chaenopetalum* Koeh.) *Vernae*, n. sp.
- (3) *Prunus latidentata* Koeh., var. *trichostoma*, n. var.
- (4) *Potentilla eriocarpa* Wall., var. *cathayana*, n. var.
- (5) *Rubus* (sub gen. *Idaeobatus* Focke, sect. *Idaeanthi* Focke) *testaceus*, n. sp.
- (6) *Rosa Mawei* Lévl., var. *plurijuga*, n. var.
- (7) *Rosa* (sect. *Cinnamomeae* D.C.) *atroglandulosa*, n. sp.
- (8) *Rosa Soulieana* Crép., var. *yunnanensis*, var. nov.
- (9) *Viburnum cylindricum* Ham., var. *crassifolium*, n. var.
- (10) *V. calvum* Rehd., var. *puberulum*, n. var.

R. J. L.

Chinese Plants, New. *Arbores Fruticesque Chineses Novi*, IV. By Camillo Schneider (*Bot. Gaz.* vol. lxiv. No. 2, Aug. 1917; pp. 137-148; with 1 plate).—Eight new species of *Salix* are described and one of *Alnus*, viz.:

- (1) *Salix* (sect. *Sclerophyllae* Schn.) *tenella*.
- (2) *S.* (sect. *Eriostachyae* Schn.) *Balfouriana*.
- (3) *S.* (sect. *Psilostigmatae* Schn.) *Guebriantiana*.
- (4) *S.* (sect. *Psilostigmatae* Schn.) *wolohoensis*.
- (5) *S.* (prob. sect. *Denticulatae* Schn.) *caloneura*.
- (6) *S.* (prob. sect. *Phylicifoliae* Dum.) *squarrosa*.
- (7) *S.* (sect. *Diplodictyae* Schn.) *Faxoniana*.
- (8) *S.* (? sect. *Sieboldianae* Seem.) *dibapha*.
- (9) *Alnus* (sub-genus *Cremastogyne* [Winkl.] Schn.).

R. J. L.

Chrysanthemum, "Crack neck," a non-parasitic disease of. By C. H. Chapman (*Phytopathology*, 9, p. 532; Nov. 1919; figs.).—The stem cracks transversely just below the flower head in the bud stage. This is said to be due to turgor arising from continued root activity with a lowered temperature about the stems. Care in watering during dull weather and the maintenance of a reasonable night temperature are regarded as the best means of avoiding the trouble.—F. J. C.

Citrus Canker in South Africa. By Ethel M. Doidge (*Dep. Agr. U. S. Africa*, 20, 1916, pp. 3-8; 8 plates).—A bulletin for Citrus-growers pointing out the serious disease of canker, and its importance to the Citrus industry.

Recognized in Florida as late as July 1912 as a serious pest imported from Japan.

Spraying tests were a complete failure in U.S.A., and fire was resorted to—tree, grass, and soil underneath tree being completely charred by a flaming spray.

Imported into S. Africa on Grape Fruit in 1905 from Florida, and spread rapidly through the imported tree orchard in the wet summer of 1908-9. All diseased fruit and wood burnt, and every tree sprayed five times with ammoniacal solution of copper carbonate, but this did not arrest it. In January 1910 the trees were pruned and prunings burnt, and Bordeaux mixture 4-4-50 was used three times, which checked the disease, and the trees free until 1916, when a few Grape Fruit were slightly marked with canker, which affects the leaves, twigs, larger branches, and fruit. Spraying with Bordeaux mixture is recommended, except where badly infected nursery stock is attacked, and then burning is the best remedy.—G. F. W.

Citrus Canker, Susceptibility and Resistance of Various Species of Citrus to. By Geo. L. Peltier (*Jour. Agr. Res.* vol. xiv. No. 9, August 1918; pp. 337-358, 4 plates).—Many plants, including the more important wild relatives, species, varieties, and hybrids of citrus, were inoculated with *Pseudomonas citri* in order to test what was their degree of susceptibility and resistance to Citrus canker. The conditions were such that the maximum amount of infection was possible, and included high temperature, much humidity, and a rapid and vigorous growing plant. It was found that *Poncitrus*, *Fortunella*, *Eremocitrus*, *Citrus*, and *Microcitrus* were susceptible, though plants of the genera *Fortunella*, *Eremocitrus*, and *Microcitrus* show some resistance to the canker. *Citrus nobilis*, with its many varieties and types, the Kansu orange, and possibly *C. mitis*, show resistance to the disease, but all are nevertheless susceptible to it. Of the hybrids the citrangequat and the citranguma remained free from the canker in these tests, while the citrandrins, limequats, and tangelos showed some resistance. The citranges, with the possible exceptions of Willits, cicitranges, citrumelos, and limelos, are all extremely susceptible to the disease.

The relative susceptibility and resistance of the plants were judged by the number, size, and character of the spots on the leaves.—A. B.

Citrus Canker, Susceptibility of Rutaceous Plants to. By H. A. Lee (*U.S.A. Jour. Agr. Res.* xv. No. 12, Dec. 1918; pp. 661-666; 4 plates).—Inoculation tests with *Pseudomonas Citri* upon twenty-four species of Rutaceae show that nineteen of these are more or less susceptible. The canker is therefore by no means restricted to the genus *Citrus*, but has many hosts amongst the Rutaceae.

Severinia buxifolia, *Aegle Marmelos*, *Balsamocitrus gabonensis* are immune to Citrus canker. *Chalcas* (*Murraya*) *exotica*, *Atalantia disticha* and *Fortunella* (*Citrus*) *japonica* are strongly resistant to the canker, but *Clauцена lansium*, *Feronia limonia*, *Feroniella lucida*, *Chaetospermum glutinosa*, *Hesperethusa crenulata*, *Paramignya longipedunculata*, *Citropsis Schweinfurthii*, *Atalantia citrioides*, and others produce positive results when inoculated with *Pseudomonas citri*.

Chaetospermum glutinosa show naturally occurring infections of the Citrus canker, and in the Philippines its susceptibility is much greater than that of the sweet orange (*Citrus sinensis*). The occurrence of natural cankers on these trees suggests that this species may have been an original wild host from which Citrus canker has spread to cultivated species.—A. B.

Citrus Fertilization Experiments. By C. F. Kinman (*U.S.A. Dep. Agr., Porto Rico Exp. Stn., Bull.* 18, May 1915; plates).—No available records of manurial experiments existed either in Porto Rico or in American orchards. An arbitrary formula had therefore to be chosen for the standard mixture, and results checked by varying the number and proportions of the ingredients in neighbouring plots. The original basic formula was:

0.775 lb. phosphoric acid,
0.666 lb. nitrogen,
0.516 lb. potash,
per tree annually.

This was afterwards modified.

The basic formula for the application since given allows 11½ lb. a tree yearly

of a mixture containing 3.6 per cent. nitrogen, 8 per cent. phosphoric acid, and 12.8 per cent. potash, and furnishes 0.45 lb. nitrogen, 0.94 lb. phosphoric acid, and 1.5 lb. potash a tree, or 62.62 lb. nitrogen, 131.5 lb. phosphoric acid, and 209 lb. potash annually an acre.

Results showed that the response of the trees to fertilization was prompt and conclusive. Check rows were originally left unfertilized, but the unfertilized trees proved a dead loss to the owners. From analysis of results it appears that trees receiving the complete fertilizer produced a decidedly greater return and made better growth than those receiving only two elements.

No nitrogen gave the poorest yield. No potash bore more than plots given no phosphoric acid or those given no nitrogen.

The average weight of the fruit was heavier where no nitrogen was given than where phosphoric acid or potash was omitted. Potash was tried in the form of muriate and as sulphate, and proved to have practically identical results in the two forms.

Nitrogen in the form of nitrate of soda or of sulphate of ammonia proved to be equally efficacious, but in the form of dried blood was not so good.

Thorough cultivation and subsoil drainage will materially lessen the quantities of fertilizer required.—M. L. H.

Citrus-Fruit. By A. D. Shamel (*U.S.A. Dep. Agr., Farm. Bull.* 794, pp. 1-16, 4 figs.).—Deterioration in the Californian Citrus orchards is due to the propagation of undesirable strains resulting from bud variation. It is desirable to keep a record of the yield of each tree. Only fruit-bearing bud-wood from good trees is used for propagation: the poor trees are top-grafted with selected buds. The spring period of growth is the best period for this operation.—S. E. W.

Clematis. By Hort (*Le Jard.* vol. xxxiii. p. 342).—*Clematis Spooneri*, a recent introduction from China, is a variety of *C. montana*, from which it is distinguished by the larger size of its white flowers. It comes into flower a fortnight later than *C. montana*, and owing to the greater substance of its petals the flowers are more lasting. It will replace *C. montana grandiflora* and *C. Wilsonii*.

C. Spooneri rosea is a hybrid of *Spooneri* and *C. montana rubens*. It possesses the luxuriant foliage and large flowers of *Spooneri* and owes the intense pink colour of its flowers to *C. montana rubens*.—S. E. W.

Clematis montana. By F. Morel (*Rev. Hort.* vol. xci. pp. 258-230; 1 fig.).—*Clematis montana* and its derivatives provide a succession of flowers from April to October. The season begins with *C. montana rubens* in April, it is followed in May by *montana grandiflora* and its hybrids *repente montana rubens* in various shades, and *repente montana grandiflora* with its pure white flowers. June brings the *repens* type. *Montana rubens* and *repente montana rubens* bear a second crop of flowers in July and August. Some specimens flower as late as October.

S. E. W.

Coal or Coke Dust. By S. Mottet (*Rev. Hort.* vol. xc. pp. 173-174).—Economy in heating the greenhouse can be effected by mixing coal or coke dust with 15-20 per cent. of clay. Sufficient water is added to form a thick paste, and this is either rolled into balls or poured into flower-pots three inches in diameter. It is ready for use when dry.—S. E. W.

Codling Moth, The, and its Control in the Western Province. By F. W. Pettey (*Dep. Agr. S. Africa, Science Bull.* No. 9, 1916; pp. 3-48, 7 figs.).—An investigation determining the life-history of the Codling Moth, made necessary by its increase in S. Africa. A large orchard near Elsenburg was used for working the life-history under out-of-doors conditions, with the help of breeding cages on the trees and in a small structure.

There are usually two generations in the year, but many larvæ hibernate in the second generation, and a few partially complete the third generation.

Spraying was performed on four sections of the orchard, each section being sprayed 1-4 times respectively with Swift's arsenate of lead paste, 2½ lb. to 50 gallons of water for the first spray, and 2 lb. to 50 gallons for the successive sprays.

The nozzle was held close to fruit clusters to get a straight drive into every calyx cup, and also on the under-surface of leaves.

All sprayings were done as soon as blossoms dropped, and the results show the advisability of spraying three times to control the two generations.

Grease bands caught 53 per cent. of the larvæ, and were only useful if the sprayings were not properly applied. The only important parasite is a chalcid, *Tricho-*

grammoidea lutea (indigenous to S. Africa); lays its eggs in the moth's eggs, which fail to hatch, and as many as four chalcids emerge from one moth's egg.

The larva's enemies are *Ichneumon* spp. and the Argentine ant.

The remaining pp. 25-48 are devoted to tables explained and referred to in the text.—*G. F. W.*

Collybia—A Wild Winter Mushroom. By F. C. Stewart (*U.S.A. Exp. Sta. New York, Bull.* 448, Feb. 1918, pp. 78-98; 10 plates).—This bulletin describes a common wild mushroom, which is excellent as food. The fungus grows in dense clusters on stumps, logs, and buried wood, usually from October to April. It has a reddish-yellow cap, white gills, and velvety-brown stem. Owing to the fact that it grows in cold weather when other fleshy fungi are scarce, there is little danger of confusing this *Collybia* with poisonous species. It is claimed that its flavour and consistency are excellent. Directions are given for cooking and preserving this mushroom.—*A. B.*

Columnnea vedrariensis. By S. Mottet (*Rev. Hort.* vol. xc. pp. 168-170; 1 fig., 1 col. plate).—*Columnnea vedrariensis* is a hybrid of *C. Schiedeana* and *C. magnifica*, surpassing the latter in vigour and shape and the former in the brilliance of its flowers. Its scarlet flowers marked with yellow last from March to May.—*S. E. W.*

Conifer Seedlings, Diseases of. By C. Hartley, T. C. Merrill, and A. S. Rhoads (*Jour. Agr. Res.* xv. No. 10, Dec. 1918; pp. 521-558).—Damping-off is the most serious disease of young seedlings, and this may be due to *Corticium vagum*, *Pythium Debaryanum*, various species of *Fusarium*, *Trichoderma* spp. and *Botrytis cinerea*. Apart from *Pythium*, *Corticium* appears to be the most dangerous fungus for conifers, because these organisms frequently set up the disease before the seed has penetrated the surface. The following fungi do not cause damping-off of seedlings: *Aspergillus* sp., *Penicillium* sp., *Trichothecium roseum*, *Fusarium acuminatum*, *Phoma betae*, *Choetomium* sp., *Rosellinia* sp.

Excessive heat or drought will cause injury closely resembling that of damping-off.—*A. B.*

Conifers at Leonardslee. By Sir E. G. Loder (*Gard. Chron.* May 10, 17, and 24; pp. 225, 236-7, 249-50).—A most valuable and carefully compiled list, giving synonyms, authorities, habitat, and varieties of Conifers in this rich collection.
E. A. B.

Cronartium ribicola: Its Morphology and Cytology. By R. H. Colley (*U.S.A. Jour. Agr. Res.* xv. No. 12, Dec. 1918; pp. 618-660; 12 plates).—The author finds that the mycelium of this fungus is more abundant in *Pinus Strobus* than in *Ribes* sp. In the first, the hyphae cause the cells of the cortex and phloem to separate and form a swelling upon the bark. This is absent in the *Ribes*. Haustoria may penetrate every cell in the infected part of *Pinus Strobus*, and they have the characteristic form of *C. ribicola*. Usually a sheath is formed round each haustorium as it matures. The haustoria on the *Ribes* are without sheaths and are much smaller.

The destructive effect on the pine of this fungus varies considerably. In young trees the attack causes their death; in older trees it causes the decay of wood, and therefore allows other fungi and insects to obtain a footing.

A full bibliography is appended.—*A. B.*

Cucumber Leaf-Spot: Its Dissemination and Control. By E. Carsner (*Jour. Agr. Res.* xv. Oct. 1918, No. 3; pp. 201-220; 4 plates).—Angular leaf-spot disease of the cucumber was first noted in Wisconsin in 1914, and its bacterial nature proved in 1915 by Smith and Bryan. The disease is widespread. The infection takes place through the stomata, and occurs chiefly during the day-time. The bacterium *B. lachrymans* is sensitive to desiccation, and is readily killed by dilute solutions of formaldehyde, copper sulphate, or mercuric chloride.

No marked variation in resistance or susceptibility has been found between the various varieties of cucumber; no other genus being attacked by the organism. Spraying checks the disease, but it is of doubtful value as a general commercial practice in combating this disease. Seed treatment offers the greater hope of satisfactory control.—*A. B.*

Cucurbita Anthracnose. By M. W. Gardner (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 727, Dec. 1918, pp. 1-68; 8 plates).—The anthracnose of *Cucurbita* is caused by the organism (*Colletotrichum lagenarium* (Pass.) Ell. and Hals.), and

its attacks are limited to various species of Cucurbitaceae. Cucumber, muskmelon, watermelon are commonly attacked. Leaves and stems as well as fruits are liable to attack. The fungus fruits by means of acervuli, which are usually formed on the attacked fruits and stems of the host plants. The disease is disseminated by rain and drainage water. Spraying with Bordeaux mixture is not practicable, and surface disinfection is suggested as a means of control. The use of disease-free seed and a proper crop rotation are recommended as control measures.—*A. B.*

Cyclamen. By H. Correvon (*Rev. Hort.* vol. xc. pp. 180-183, 196-198).—A monograph of the 24 varieties of *Cyclamen* growing wild in Europe.—*S. E. W.*

Date Palms. By B. Drummond (*U.S.A. Dep. Agr., Farm. Bull.* 1016, pp. 1-23; 10 figs.).—The Date Palm is propagated by offshoots cut from the parent with a chisel in spring. The offshoot is left on the ground for ten days to harden. It is then planted at a depth of 8 inches in rich soil in a frame in which the air is kept as warm and moist as possible and free from draughts. When well rooted, the offshoots are transplanted in their permanent positions. The young palms are wrapped in newspapers to protect them from frost in their first winter. It is essential that the orchard contains male palms in the proportion of 2 to 50. Artificial pollination is necessary to ensure good crops.—*S. E. W.*

Deinantha coerulea. By P. Hariot (*Le Jard.* vol. xxxii. p. 268).—*Deinantha coerulea* is distinguished from *D. bifida* by its blue flowers and by its hairy leaves. It is a native of Hupeh. —*S. E. W.*

Desert Plants as Emergency Feed. By E. O. Wooton (*U.S.A. Dep. Agr., Bull.* 728, pp. 1-31; 8 plates).—In times of drought, cattle and sheep on range may be fed on the following plants, if the leaves and stems are chopped and shredded by machinery: 'Soap Weed' (*Yucca elata*), *Y. macrocarpa*, *Y. baccata*, *Agave lachuguilla*, 'Sacahuista' (*Nolina crumpens*), 'Bear grass' (*N. microcarpa*), and 'Sotol' (*Dasylirion Wheeleri*).—*S. E. W.*

Digitalis, a Hybrid. (*Rev. Hort.* Dec. 16, 1919. No. 24, p. 396).—Seeds of a Foxglove which had appeared in the garden of M. Lutz, the Secretary of the Société botanique de France, and which he regarded as an imitation of *D. purpurea*, were given to M. Ph. de Vilmorin in 1911. Among the twenty-five seedlings raised at Verrières there were three forms: (1) with buff-coloured flowers and hairy foliage; (2) with purple flowers and glabrous foliage; (3) with yellowish-white flowers. Plants of each form were protected from cross-pollination; and from the seeds of (1) were raised thirty-seven plants, but most were weak and did not flower. Only five produced good buff-coloured flowers. From (2) five plants were raised, three with purple flowers and two with buff flowers. (3) produced no seed.

For the next generation the best of the seven plants with buff flowers was selected but not protected from cross pollination with the others, though the purple flowered forms were destroyed before the pollen became available. From the seeds thus obtained some three hundred plants flowered in 1913, of which all but thirteen bore buff-coloured flowers. This hybrid foxglove grows to about five feet in height and there seems no doubt that the original seeds owed their hybrid character to the fact that M. Lutz had in cultivation *D. lutea* as well as *D. purpurea*.—*W. R. D.*

Dusting v. Spraying. By D. Reddick (*U.S.A. Dep. Agr., Bull.* iii., vol. xvii., pp. 52-68; 1 fig.).—As a check to chewing insects and fungus diseases, dusting with a mixture of 90 per cent. powdered sulphur and 10 per cent. lead arsenate requires less time and labour than spraying.—*S. E. W.*

Dynamite in Planting. By T. E. Chase (*U.S.A. Dep. Agr., Bull.* iii., vol. xvii. pp. 27-35).—When a large number of trees have to be planted, it is economy of labour to use dynamite in preparing the holes for the trees. The sticks of dynamite are buried to a depth of 18-24 inches.—*S. E. W.*

Electro-Culture. By H. Blin (*Le Jard.* vol. xxxiii. pp. 339-342, 347-350; 8 figs.).—Various devices are described for passing electric currents through the soil. Increased crops result from this treatment.—*S. E. W.*

Explosives: Use of, in Orchards. By A. Piédallu (*Le Jard.* vol. xxxii. p. 285).—In the devastated regions of France the work of replanting the orchards is facilitated by the use of explosives in preparing the sites for tree-planting.

S. E. W.

Fats from *Rhus laurina* and *Rhus diversiloba*. By James B. McNair (*Bot. Gaz.* vol. lxiv. No. 4, October 1917; pp. 330-336; 1 figure).—The writer has isolated from the ripe fruit of *R. laurina* and *R. diversiloba* substances very similar to Japan wax. Increase in the fat content of the fruit of *R. diversiloba* was found to occur simultaneously with a decrease in its poisonous properties. This decrease in the ripening of the fruit results in its becoming non-toxic. The phenomenon is not necessarily due to a chemical transformation of the poison into fat, for: (1) Subsequent to the formation of fat the cells in which it is deposited become filled with starch; (2) it is possible for the plant to transform starch into fat; (3) fat is not formed in the parenchymatous sheaths of the resin passages; (4) consequent upon the formation of fat, the resin passages are everywhere constricted by the growth of parenchyma sheaths; and (5) a similar fat has been found in the fruit of a non-poisonous species of *Rhus*.—*R. J. L.*

Freezias, Improvement of. By A. Ragonneri (*Gard. Chron.* Oct. 4, 1919; p. 181).—Records the first crosses made in 1878, between *F. refracta alba* and *F. Leichtlinii*, and of the resulting races with *F. Armstrongii* in 1905, and other interesting facts.—*E. A. B.*

Fruit. By W. J. Green and J. B. Keil (*U.S.A. Exp. Stn., Ohio, Bull.* 313, pp. 601-614; 1 plate).—A list of the best varieties of fruit grown in Ohio.—*S. E. W.*

Fruit Diseases (*Bull. State Comm. Hort., California*, vii. 9, Sept. 1918; 25 figs.).—Contains papers on Grape Mealy Bug, Bud Curl of Lemon Tree, The Oriental Peach Moth, &c. Also notes by Robert W. Hodgson on "Little Leaf of Deciduous Fruit." This little leaf condition has been known for many years, and is characterized by the failure to leaf out at the normal time, and finally, when the leaves are produced they are small, narrow, and yellow. The whole tree may be involved, or one or two limbs only. Fruit may fail to set, or if it does set it shrivels and drops. The cause is at present unknown, but it is most prevalent in soils that lack moisture and nutrition.—*V. G. J.*

Fruit Drying. By J. H. Beattie and H. P. Gould (*U.S.A. Dep. Agr., Farm. Bull.* 993, pp. 1-61, 22 figs.).—A description of the methods used in the States for drying apples, pears, prunes, peaches, raspberries, and loganberries.—*S. E. W.*

Fruit Insects, Papers on. By F. E. Brooks and B. R. Leach (*U.S.A. Dep. Agr., Bull.* 730, Dec. 1918; 8 plates, 1 fig.).—This bulletin deals with (1) The Grape Curculio, (2) the Grape Root-borer, and (3) Experiments in the control of the root form of the Woolly Apple Aphis. With regard to the latter, carbon bisulphide in solution at the rate of one half-ounce to four gallons of water, and applied at the rate of three-quarters of a gallon to each square foot of soil will control this form of aphis under suitable soil conditions. The liquid is best applied by preparing shallow basins about the tree when the soil is in a moist condition.

The gas diffuses laterally and vertically only as far as the liquid penetrates, and therefore every foot of infested soil must be subjected to the action of the solution in order to ensure success.

The treatment may be made any time during the growing season, except for a period of two or three weeks in the spring when the trees are budding out.—*V. G. J.*

Fruit Protection. By V. Enfer (*Rev. Hort.* vol. xci. pp. 294-295).—Apples and pears are protected from spot, insect pests, and hail by enclosing the small fruit before the middle of June in paper bags (5½ inches by 8 inches). The corners at the bottom are cut off so as to leave small openings to admit air. The bags are gradually cut away in September in order that the fruit may colour and harden.—*S. E. W.*

Fumigation: Hydrogen Cyanide Fumigation. By E. E. Clayton (*Bot. Gaz.* vol. lxvii., No. 6, June 1919, pp. 483-500; with 2 figures).—The investigations described in this paper were carried out with the view to determining how green plants are affected by exposure to hydrocyanic acid.

The following summary of results is given:—

1. Different concentrations of hydrocyanic acid gas gave effects ranging from stimulative to depressive. The maximum of beneficial results was secured with concentrations* deadly to insect life, but just a little below the point of first injury to the plant.

2. External factors having important action on the resistance are as follows : (a) wetting the leaves had a beneficial effect on the tomato ; (b) reduced temperature and low light intensity during the day preceding fumigation increased resistance.

3. Injury closely paralleled the stomatal movement, increasing as the size of stomatal aperture increased.

4. A higher or lower water supply in the soil affected resistance, through hastening or retarding the growth rate. Rapid-growing plants were susceptible to injury, while slow-growing plants were more resistant.

5. High-reducing sugar content seemed to be correlated with maximum resistance.—R. J. L.

Green Plant Bug, The Southern. By Thos. H. Jones (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 689, July 1918 ; 14 figs. ; 5 tables).—This pentatoid bug (*Negara viridula* L.) causes severe injury to crops in the southern portion of the Cotton Belt, attacking tomatoes, potatoes, beans, turnips, sweet potatoes, mustard, and a great variety of other plants. Injury is caused by the adults and nymphs puncturing the plant tissue with their beaks and extracting the juices of young growing shoots and developing fruits.

Four natural enemies have been noted, the tachinid fly (*Trichopoda pennipes* Fab.) apparently being the most important.

Hand-picking and collecting eggs and nymphs is recommended, as sprays are of very little use.—V. G. J.

Greenhouses : Heating. By P. Rivoire (*Rev. Hort.* vol. xc. pp. 157-158).—A mixture of coal-dust, slaked lime, and water, is made into a paste and cast into briquettes in an iron mould. The slaked lime from 5 lb. of quick-lime and two gallons of water are required for every 100 lb. of coal-dust. The briquettes are dried in the shade for a week before use.—S. E. W.

Gunnera chilensis and manicata. By O. Stapf (*Gard. Chron.* Oct. 25, 1919 ; p. 210, with fig.).—The best means for distinguishing these two species lies in the inflorescences. The branches are slender, flexuous, up to 6 inches long in *G. manicata*, but rigid, stout, and only 1-3 inches long in *G. chilensis*. The fruits of the former do not assume the bright orange-red of the latter at Kew.—E. A. B.

F. L. Ratgers (*Gard. Chron.* Nov. 8, 1919, p. 236) points out that *G. manicata* ripens its fruits in Holland, and they are then of a dark orange colour.

Also mature leaves of *G. manicata* are flattish and unfolded, while those of *G. chilensis* are more curled, crumpled, and smaller.—E. A. B.

Hardening Process in Plants, and Developments from Frost Injury. By R. B. Harvey (*Jour. Agr. Res.* xv. pp. 83-112, Oct. 1918 ; plates).—A study of the effects of freezing on different plants and the resulting stimulation of tissues, and in certain cases, death. The results of desiccation, plasmolysis, and freezing are considered to be of a similar nature.—F. J. C.

Heart Rot in Wood of the Western Hemlock (*Tsuga heterophylla*). By Jas. R. Weir and E. E. Hubert (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 722, Oct. 1918, pp. 1-39 ; 13 figs.).—The fungus responsible for the decay of the heart-wood of *Tsuga heterophylla* is *Echinodontium tinctorium* E. and E. (the Indian paint fungus), and this enters the trees by wounds in the bark and dead branches and soon extends to the heart-wood, which in time is entirely destroyed by the disease. The extent of the decay increases with the age of the tree. Of the total trees in Northern Idaho 97 per cent. were found to be attacked, and of ten trees less than sixty years old, nine were infected.

It is suggested that all infected trees should be destroyed by fire, as girdling by the axe is not recommended.—A. B.

Heat, Stem Lesions caused by excessive. By C. Hartley (*Jour. Agr. Res.* xiv. pp. 595-604, Sept. 1918 ; figs.).—Death of seedlings of pines through damage to the stem at soil level occurred in certain nurseries. The damage, which had been called 'white spot,' was traced to excessive heat.—F. J. C.

Heredity in Annual Beetroots and Carrots. By L. Daniel (*Rev. Hort.* vol. xc. pp. 164-167 ; 5 figs.).—Biennial carrots come true from seed but annual carrots show a great diversity of form, depending on the locality and the conditions under which they are grown. Beetroots exhibit the same phenomena. These results do not conform with Mendel's law. On no account should the seed of the annual carrot be mixed with the biennial as it is worthless.—S. E. W.

Inbreeding and Crossbreeding, The Effect of, upon Development. By D. F. Jones (*U.S.A. Exp. Sta., Conn., Bull.* 207, Sept. 1918; 3 figs., 30 tables, 12 plates).—The main conclusions are given as follows:

Effects of Inbreeding.—1. Continued inbreeding results in the segregation of a variable complex into a number of diverse types which are uniform within themselves.

2. The segregates which differ in visible qualitative characters also differ in quantitative characters; types with abnormalities appear which cannot reproduce themselves; others appear which are perpetuated with difficulty; others are obtained which are perfectly normal in structure and function. These latter are usually less well developed, but may be as well or better developed than the original stock from which they are derived.

3. The change in size, structure, or function, and reduction in variability, is most noticeable in the earlier generations of inbreeding, rapidly becomes less, and the surviving inbred strains are uniform and constant.

4. The rate of approach to uniformity and constancy differs in different lines.

5. These uniform and constant inbred strains are quite comparable to naturally self-fertilized species.

6. No single effect can be attributed to inbreeding other than the reduction in variability.

7. All these results are in conformity with Mendel's law and Johannsen's genotype conception.

Effects of Crossbreeding.—1. Heterosis (*i.e.*, "hybrid vigour" or "stimulus accompanying heterozygosis") accompanies heterogeneity in germinal constitution, whether or not the organisms crossed are from the same or diverse stocks.

2. Heterosis is widespread in its occurrence throughout the plant and animal kingdoms.

3. Heterosis is shown as an increase in the size of parts, rather than an increase in the number of parts.

4. Cross-fertilization is without effect until the zygote is formed; from that time on, heterosis may be apparent throughout the life of the individual.

5. Heterozygosis has an undiminished effect on plants propagated vegetatively.

6. Heterozygosis may have a stimulating effect on some characters, and a depressing effect on others, in the same organism.

The author finally concludes that, whatever may be the value or significance of heterosis, to account for this phenomenon it is for the most part unnecessary to assume that there is an indefinite stimulating effect of hybridization along with the expression of definable hereditary factors. Hence the distinction is no longer needed between the effects of self-fertilization and cross-fertilization and of heredity in development. The heretofore indefinite physiological stimulation resulting from heterozygosis, and the related effects accompanying the loss of this stimulation following inbreeding, can therefore be given a strictly Mendelian interpretation.

This being so, there is no longer a question as to whether or not inbreeding *per se* is injurious. Whether good or bad results from inbreeding depends solely on the constitution of the organisms before inbreeding is commenced. Inbreeding is concerned only with the manifestation of conditions pre-existing. As a means of analysing and of purifying a cross-bred stock by the elimination of undesirable qualities, inbreeding is therefore a method of first importance in plant and animal improvement.—*F. G. A.*

Inheritance of Sex in Strawberries. By R. D. Anthony (*U.S.A. Exp. Sta. New York, Tech. Bull.* 63, Sept. 1917).—An incomplete study. When imperfect varieties (those with pistils only) have been pollinated by perfect sorts (those with pistils and stamens), the resulting seedlings of the two types have been in about equal numbers. When two perfect sorts have been crossed, almost the whole of the progeny has been perfect; but when perfect varieties have been self-pollinated, about one-quarter have been imperfect or only semi-perfect (filaments partially developed, but anthers abortive if present). More than one year's observation is sometimes necessary to say whether a seedling will eventually develop into a perfect sort or not.—*A. P.*

Insects, Sucking, and Mites of the Apple. By W. H. Brittain (*College of Agr., Truro, N.S., Cir.* 17, 1917, pp. 3-15; 1 fig.).—This pamphlet deals with the life histories and control measures of 8 sucking insects and 2 mites, and points out the equal importance of spraying for sucking insects as for biting insects.

(1) The Green Apple Bug, *Lygus communis* var. *novascotiensis*, Knight;
(2) Black Apple Leaf, *Idiocerus fitchii*, Rose Leaf, *Empoia rosae*, and Apple-leaf

Hoppers, *Empoasca mali*, (3) Green Apple Aphis, *Aphis pomi*, (4) Rose Apple Aphis, *Aphis sorbi*, (5) Grain Aphis, *Siphocoryne avenae*, (6) Woolly Apple Aphis, *Eriosoma lanigera*, (7) Oyster Shell Scale, *Lepidosaphes ulmi*, (8) Pear Psylla, *Psylla pyricola*, (9) Pear-leaf Blister Mite, *Eriophyes pyri*, and (10) Apple-leaf Mite, *Phyllocopces schlectendali*.

Nos. 1-6 and 8 are controlled by nicotine sulphate, 1 pt. to 800 pts. water, and Nos. 7, 9, and 10 by commercial lime sulphur, 1-10.—G. F. W.

Iris. By F. Denis (*Rev. Hort.* vol. xci. p. 362).—Hybrids have been obtained from *Iris aurea* and *I. fulvata*, *I. tectorum* and *I. pallida dalmatica*, and from *I. Xiphium* and *I. filifolia*.—S. E. W.

Kochia trichophylla (*Le Jard.* vol. xxxiii. p. 305; 2 figs.).—*Kochia trichophylla* is an ornamental pot-plant and an addition to the open border. It is about three feet in height and is covered with light-green foliage which turns dark-purple in autumn.—S. E. W.

Larch Chermes, Cnaphalodes strobilobius (Kalt.), A Contribution to the Life History of the. By E. R. Speyer (*Ann. App. Biol.*, vol. vi. Dec. 1919, pp. 171-182, 13 figs., 2 plates).—This insect is usually known as Larch Blight, on account of its secretion of white "wax-wool" on the leaves during the spring and summer.

A detailed description is given of the parthenogenetic cycles on the Larch, including the Sistentes, Progredientes and Sexuapara stages.

A diagram is given to show accurately the origin and development of the Colonial generations. The worst damage is done to young Larch plants, but these can be cleared by fumigation. Spruce does not suffer severely when young. The compulsory fumigation of all young Larch trees is urged before planting, in order to give the plants a chance to grow away clean. Control by spraying is confined to the sexual generation found during a short period in the summer, but at present it is insufficiently understood to advise.

The paper concludes with an account of the more satisfactory treatment by sulphuric ether of preparing Aphidæ for microscopic examination.—G. F. W.

Leonitis dysophylla. By P. Haricot (*Le Jard.* vol. xxxiii. p. 306).—*Leonitis dysophylla*, a native of S. Africa, is an herbaceous plant about three feet high, bearing orange-coloured flowers.—S. E. W.

Light Traps, Female Lepidoptera at. By W. B. Turner (*Jour. Agr. Res.* xiv. pp. 135-149; July 1918).—This paper gives the details of experiments made to ascertain whether the accepted idea that nearly all Lepidoptera caught at light traps are males—or, if females, that they have already oviposited—is correct.

Details are given of the experiments, and tables of the number of male and female Lepidoptera caught by an arc lamp of 300 candle-power. In the case of the females caught, the condition of the ovaries, whether spent or gravid, is given.

In seven cases out of twenty-four, the number of females caught was in excess of the number of males.—G. F. W.

Lime and its Uses and Functions in Soils, Some General Information on. By M. M. McCool and C. E. Millar (*U.S.A. Exp. Stn. Mich., Special Bull.* 91, Dec. 1918, pp. 21; 12 illus., 3 tables).—When applied to soils that are deficient in it, lime may alter the structure, neutralize acids and other injurious substances, satisfy the silicates, make mineral plant food elements available, increase the rate of decay of vegetable matter, make manures and fertilizers more efficient, and supply lime needed in the formation of plant food. If the soil is deficient in lime, the common crops, with few exceptions, respond to its use. Field trials should always be conducted when one applies lime to the soil. It should be applied in the rotation as near as practicable to the crops that are most benefited by it, especially if small applications are made. Thorough mixing with the soil is essential. Finally, lime should be looked upon as only one of the conditions involved in permanent systems of soil fertility. Since its presence in the soil results in a somewhat more rapid decay of vegetable matter, precautions must be taken to maintain this substance which is so vital to soil productivity.—F. G. A.

Loganberry, A Chemical Examination of the. By M. R. Daughters (*U.S.A. Exp. Stn. Oregon, Bull.* 151, April 1918).—Though this fruit was only introduced in 1884, the sales of its juice in 1917 amounted in value to over a million dollars. The residual pulp has a high calorific value, and it is suggested that the addition

of sodium carbonate would neutralize its acidity, and make it palatable to farm animals. A good jelly has been made from the pulp, from which also an oil has been extracted, which it is thought would make a good substitute for linseed oil.—A. P.

Lupins, Value of, in cultivation of poor light land. By A. W. Oldershaw, M.B.E., B.Sc. (*Jour. Min. Agr.* vol. xxvi. No. 10, Jan. 1920).—An article chiefly for the farmer as it deals with production of feeding stuff for sheep, as well as the improvement of the land on which lupins are grown. The effect of a crop of lupins upon the succeeding crop is astonishing, and the author considers their value as a means of improving and reclaiming poor light land is not sufficiently appreciated in this country. They grow with surprising luxuriance upon poor blowing sand, which will grow practically nothing else but rye. They are usually sown in April or early May for seed, but may be sown as late as August for green manuring.—G. C. G.

Maple Sugar. By A. H. Bryan, M. N. Straughn, C. G. Church, A. Given, and S. F. Sherwood (*U.S.A. Dep. Agr., Bull.* 446, pp. 1-45).—The authors describe the methods of estimating the amount of sucrose, invert sugar, malic acid and ash in maple sugar and syrup. One gallon of maple syrup should weigh 11 lb. A weaker product does not keep, and a heavier one has a tendency to crystallize. The solid contents consist of 95 per cent. sucrose, 3 per cent. invert sugar, 1 per cent. malic acid, and yield about 1 per cent. of total ash (0.37 per cent. insoluble ash). Maple sugar produced in the North yields less ash and malic acid than that made in the South.—S. E. W.

Melons, Pumpkins, and Cucumbers, Enemies of. By A. Rolet (*Le Jard.* vol. xxxii. p. 264).—*Aphis papaveris* and *A. brassicae* are destroyed by spraying the under side of the foliage with one of the following mixtures: nicotine (1 or 2), spirits of wine (1), and 100 of water. The spirits may be replaced by an equal weight of black soap; tobacco extract diluted with 15 times its volume of water containing $\frac{1}{2}$ per cent. of carbonate of soda. Under glass fumigate at night. Spray with infusions of fresh tan, leaves of *Digitalis*, *Datura*, *Wormwood*, *Belladonna*, *Black Hellebore*. Coffee-grounds spread on the soil drive away the *Aphis*. For Red Spider, in addition to the above, weak emulsions of black soap and petroleum, naphthol (20 grams), soap (60 grams); 1 litre of nicotine and 11 litres of soft water; carbon bi-sulphide and alcohol; 0.5 per cent. potassium pentasulphide solution.

When repeated washing with water does not remove thrips, apply some of the remedies just mentioned. Strong doses of carbon bi-sulphide injected into the soil before planting keeps away Myriapods, white and grey worms, and Mole crickets. Plants are protected from slugs and snails by a ring of quicklime or powdered sulphate of iron. Ants defy tobacco, but some insecticides keep them away. A species of Ladybird (*Epilachna chrysomelina*) attacks the leaves of cucumbers. Spraying with a weak emulsion of black soap and petroleum or tobacco extract is the remedy.—S. E. W.

Mesembryanthemum. By E. Jahandier (*Rev. Hort.* vol. xci. pp. 372-375; 2 figs.).—Many varieties of *Mesembryanthemum* would flourish in poor soil in the maritime regions of the South of France. The most remarkable members of this group are: *M. Bolusii* from S. Africa and the nearly related *M. simulans*, *M. testiculatum*, and *M. pseudotruncatellum*, all with golden flowers. The existence of these plants may be easily overlooked when not in flower, as their foliage harmonizes with the pebbles and rocks of their native habitat. *M. concinnum*, from Damaraland, has fleshy leaves covered with white tubercles. *M. ligrinum* has marbled leaves, the edges of which are fringed with long hairs. *M. felinum* is remarkable for the denticulation of its leaves. *M. digitatum*, a native of the Cape of Good Hope, has long finger-like leaves. *M. Barklyi*, from Namaqualand, is still more remarkable, as its long leaves (10 inches by 5 inches) are filled with aqueous sap.—S. E. W.

Necrobia ruficollis (Fabr.), Notes on the Biology of. By H. Scott (*Ann. App. Biol.* vi. Dec. 1919, pp. 101-115, 2 figs.).—This beetle, amongst other insects, was found breeding in the débris of old food, sawdust etc., in shallow vessels used for the experimental breeding of house-flies at the S.C.S., S. Kensington, in 1917-18, and formed the subject for experiments as to its little-known life-history.

It bred throughout the year in a temp. of 64° F.

The adults were seen to eat dead fly larvæ and the soft parts of dead flies, but they do not appear to kill fly larvæ. Larval and pupal stages of the beetle are described.—G. F. W.

Neillia and Stephanandra. By S. Mottet (*Rev. Hort.* vol. xci. pp. 236-238; 1 fig.).—*Neillia sinensis* is an ornamental shrub well worth a place in the garden on account of its graceful foliage and sprays of pink flowers. *N. affinis*, *N. longiracemosa*, *N. tibetica*, and *N. vibesoides* are recent introductions from Szechwan. *N. pauciflora* is a native of Yunnan. All the above have dark-pink flowers. Another new arrival is *Stephanandra chinensis* from Kiangsi, which differs from *S. incisa* by having larger and more deeply incised leaves.—S. E. W.

Nitrates, Nitrification of Acid Soils, Effects of Lime, Crops, and Moisture on. By H. A. Noyes and S. D. Conner (*U.S.A. Jour. Agr. Res.* xvi., No. 2, Jan. 1919, pp. 27-43; 9 plates).—Experiments were made with five typical acid soils treated with calcium carbonate, acid phosphate, and complete fertilizer, cropped with wheat and clover. Control experiments were also made without crops or fertilizer, and with varying quantities of water. It was found that CaCO_3 increased in a marked manner the nitrification of the five soils. The degree of saturation of the soils affected the nitrates present. More nitrate was found in soil kept half-saturated with water than in soil a quarter saturated. Fully saturated soils (for ten months) contained no nitrates, and no nitrates were formed with ammonium sulphate. The bacterial flora of each soil was different, and CaCO_3 increased the number of aerobic organisms. In general, the greater the aerobic bacterial content and the nitrifying power of the soil, the larger the crop-yields.

A bibliography is appended.—A. B.

Nitric-Nitrogen Accumulation in Soil, Influence of Salts on the. By J. E. Greaves, E. G. Carter, and H. C. Goldthorpe (*U.S.A. Jour. Agr. Res.* xvi., No. 4, Jan. 1919, pp. 107-135).—Salts which occur in soils, or which may be applied to them, influence the number, species, and activity of the micro-organisms in the soil. These factors in turn are reflected by the yields obtained from the soil. The objects of the investigation were: (1) To determine the relative toxicity of various substances in the soil as measured by bacterial activities; (2) to determine the stimulating influence of various substances upon bacterial activity, and the manner in which the stimulus is exerted. The soil used was sandy loam with a high percentage of acid-soluble constituents. Calcium and magnesium carbonates present in great amounts.

The authors' conclusions were as follows:

The toxicity of chlorides, nitrates, sulphates, carbonates of Na, K, Ca, Mg, Mn, and Fe, as determined by nitrification, is determined by the specific salt, not by the electro-negative ion, as in the case of ammonifiers. Except MnCl_2 , MnSO_4 , NaCl , FeCl_2 , and FeSO_4 the salts all became toxic at a lower concentration to the nitrifiers than to the ammonifiers.

The common alkalis CaCl_2 , Na_2SO_4 , Na_2CO_3 , CaNO_3 are very toxic to the nitrifying organisms, and reduce greatly the nitrogen accumulation in such a soil.

The compounds which are the strongest plant stimulants are also the most active in increasing the nitrogen accumulation, and it seems probable that the effect upon the plant is due mainly to the action of the compound upon the bacteria, which in turn render available more plant food.

Magnesium nitrate, ferric nitrate, calcium nitrate, and manganous nitrate are very active stimulants of the nitrogen fixing organisms. In some cases these compounds increase nitrogen fixation many times over that in the normal soil.

The ammonifying powers of a soil containing alkalis are a better index of its crop-producing powers than are the nitrifying powers.—A. B.

Nitrification III. The Isolation and Description of the Nitrite Ferment. By Augusto Bonazzi (*Bot. Gaz.* vol. lxxviii., No. 3, Sept. 1919, pp. 194-207; with 1 plate).—In this paper are described the organisms responsible for the formation of nitrites in the Ohio soils, and the methods used in their isolation. Z. Winogradsky classified the cocci which convert soil ammonia into nitrates as follows:—

- (i) *Nitrosomonas*—from the Orient or Old World.
- (ii) *Nitrococcus*—from the Occident or New World.

No samples of soil from the North American Continent were studied by him, all his material coming from South America.

The organisms isolated by the present writer appeared during the process of full nitrification as small granules contained in a thick gelatinous mass. This gelatinous layer surrounding the cells is of the same thickness as their diameter. With iodine it acquires a bluish tinge, while the embedded cells stain golden yellow.

When the process of nitrification is intense, the ordinary cocci (megalogocci) give rise to smaller cocci. These are set free and begin independent existence, leaving the empty sheaths. They may later acquire a gelatinous coat, and revert to megalococci.

For staining these organisms, malachite-green and gentian violet were found to be most effective. Preparations thus obtained show the jelly of the megalococci a deep purple colour, and the small cocci appear of a purple-black colour.

The thermal death-point of the organisms studied was found to lie between 50° and 55° C.—R. J. L.

Nitrogen-fixing and Nitrifying Organisms, Effects of Carbon Bisulphide and Toluol upon. By P. L. Gainey (*U.S.A. Jour. Agr. Res.* xv., No. 11, Dec. 1918, pp. 601-614).—Carbon bisulphide and toluol, when applied to soils in sufficient quantities, will destroy Azotobacter group of organisms and check the accumulation of nitrate nitrogen, and will destroy the nitrifying organisms. The quantities necessary to produce such effects vary widely, and depend upon the amount of moisture present. Other nitrogen-fixing organisms are not destroyed by 10 c.c. of CS₂ or toluol, even when the moisture content of the soil is high. There is no evidence in these experiments to show that treatment with antiseptics stimulates the nitrifying organisms, and there is little evidence to indicate a stimulative effect upon the ammonifying or nitrogen-fixing organisms.

A. B.

New Plants (*Rev. Hort.* vol. xci. pp. 260-262; 2 figs.).—*Columnnea hirta* flourishes in hanging baskets in a warm house. It bears large scarlet flowers spotted with yellow. *C. hirta glabra* is distinguished from the former by its beautiful bronze foliage.

Feijoa Sellowiana is hardy in the South of France. It bears magnificent red flowers with bright carmine stamens. *Loropetalum chinense* is hardy. In early spring it is covered with white flowers.

The following varieties of *Hydrangea hortensis* are suitable for forcing:—‘Amazona,’ white fimbriated; ‘Etincelant,’ dwarf, bright carmine; ‘Satinette,’ carmine red; ‘Trophée,’ dark carmine.

The following are hardy:—*Actinidia purpurea*, climber with white flowers and purple fruit; *Dipelta floribunda* is covered in spring with white tubular flowers; *Pyracantha crenulata*, from Yunnan, red berries; *Viburnum rhytidophyllum*, evergreen; *V. betulifolium*, large corymbs of small white flowers and cherry-red berries; *Deutzia crenata candidissima plena* and *D. Vilmorinæ* are the parents of *D. c. macrothyrsa* (very floriferous), *D. c. mirabilis* (milk white), and *D. c. staphyleoides*, which has large flowers resembling *Staphylea*.

Hybridization of *Philadelphus microphyllus* by *P. coronarius* and *P. grandiflorus* yielded ‘Coupe d’argent’ with white flowers like a single rose; ‘Girandole,’ double; ‘Bicolore,’ white with purple marks; ‘Nuage,’ rose-white flowers with pink centre slightly fimbriated; ‘Sylvanie,’ white with pale pink centre.

Diervilla ‘Profusion’ is a hybrid from *D. japonica*. Early in May the shrub is covered with panicles of carmine pink flowers.

The lilac ‘Edith Cavell’ is double white; ‘Paul Thirion’ wine-coloured; ‘Maurice Barrès’ is one of the most beautiful and floriferous lilacs, remarkable for large lilac-blue panicles; ‘Mont Blanc’ is the finest single white; ‘Saturnale Précoce,’ single bluish mauve; ‘Vésuve,’ single purple.

Recent introductions from China are *Syringa Wilsonii*, a large shrub with pale pink flowers; *S. Sweginowii superba*, pale pink with pleasant perfume; and *S. reflexa*, pink.—S. E. W.

Oenothera rubrinervis, A Half-Mutant. By Hugo De Vries (*Bot. Gaz.* vol. lxvii., No. 1, Jan. 1919, pp. 1-26).—The genetic constitution of *Oenothera rubrinervis* is discussed and the experimental evidence detailed.—R. J. L.

Onion Bulbs, White Rot Disease of. By A. D. Cotton and M. N. Owen (*Jour. Min. Agr.* vol. xxvi. No. 11, Feb. 1920).—A disease causing considerable damage to onion crop, which, however, until recently, has not attracted serious attention. The fungus has been isolated and identified as *Sclerotinia cepivorum*, described by Berkeley in 1841, and is quite distinct from *Sclerotinia bulborum* and *Botrytis cinerea*, both of which have been regarded as the cause of the trouble in question.

It has been popularly called Dry Rot, White Rot, Mouldy Nose, and in the North, erroneously, “Mildew.”

Onions become attacked by White Rot from contaminated soil, and usually first show signs of the disease at end of May or early in June. The leaves wilt and turn yellow, the oldest leaves first, and ultimately collapse, when plants

can be readily pulled up. It is probable that roots suffer first. The base of the bulb shows a mass of fluffy white fungus spawn or mycelium, and this distinguishes it at once from all other onion diseases. In advanced stages of the disease, the fluffiness disappears and is replaced by a closely fitting web, in which numerous dark bodies, the sclerotia, are developed. These bodies are left in the soil when plants rot, and are the cause of reinfection another season. Both autumn-sown and spring-sown onions are attacked, and the disease is most in evidence from June to early August. By August attacked plants have been mostly killed, and few fresh infections take place after.

The disease is not carried by the seed, but appears to be transferred by infected soil being conveyed on roots of onion plants and on infected plants sold for transplanting. No remedies can be suggested, but efforts should be made to avoid infection and to keep onions off infected ground, which, however, carries infection for some years. All common varieties seem subject to attack, but shallots and leeks are markedly resistant, although not immune. Diseased plants should be removed and burnt as soon as seen.—G. C. G.

Onion Thrips, Control of the. By F. H. Chittenden (*U.S.A. Dep. Agr., Farm. Bull.* 1007, January 1919; 11 figs.).—The Onion Thrips (*Thrips tabaci* Lindeman), a minute prolific insect which causes damage to the United States onion crop to the extent of at least \$250,000 annually. This thrips also preys upon cabbage, cucumber, and many other garden and truck crops. It also breeds upon a large variety of weeds. Clean farming and proper crop rotation help to control the pest. Spraying with nicotine sulphate has proved very effective treatment:—Nicotine sulphate (40 per cent.), $\frac{1}{2}$ pint; soap (dissolved), 4 or more pounds; water, 50 gallons.—V. G. J.

Orchard Irrigation. By J. H. Fertier (*U.S.A. Dep. Agr., Farm. Bull.* 882, pp. 1-40; 39 figs.).—S. E. W.

Pea and Bean Weevils. By E. A. Back and A. B. Duckett (*U.S.A. Dep. Agr., Farm. Bull.* 983, Sept. 1918; 24 figs.).—These insects not only destroy much of the nation's food in the form of leguminous crops, but are responsible for a curtailment in the acreage planted to these crops. They never attack corn or wheat. There are no satisfactory remedies that can be applied to kill weevil grubs in growing crops, the only thing is to harvest the crops as soon as possible after maturity, and the seeds should be thrashed out and treated by fumigation, heat, or cold storage, in order to kill the weevils in them before they mature.—V. G. J.

Peach Leaf-curl (*Exoascus deformans*). By W. Laidlaw and C. C. Brittlebank (*Jour. Agr. Vict.* Aug. 1918, pp. 479-484).—Trials over several years were made on an orchard badly subject to this disease; the following mixtures were used: Bordeaux, 6-4-40; copper soda, 6-8-40; lime sulphur, 1 in 9; and acetate of copper (verdigris), 3 lb. to 40 gallons of water; all mixtures were carefully prepared and tested; the testing is important, as acid mixtures are liable to burn and russet the fruit. Verdigris and copper soda made the foliage quite free from curl; though the results obtained with acetate of copper were excellent, the high price of the material compelled its abandonment. Bordeaux mixture did not give quite such good results as the two previous sprays, and lime sulphur, though it cleaned all lichens from the trees, was not a success as far as the leaf-curl was concerned. In continuing the experiments, as copper soda gave better results than Bordeaux, for the last three seasons it was used exclusively. The right time to apply the spray is just before or when the earliest buds are showing pink. The mixture used with complete success was copper soda, 6-8-40.—C. H. H.

Pear Blight (*Bull. State Comm. Hort., California*, vii. 10, October 1918).—Among other items contained in this bulletin is a paper by F. C. Reimer entitled "A New Disinfectant for Pear Blight." Experiments described show that 10 per cent. strength formaldehyde is the best disinfectant to apply to cut surfaces and tools to prevent the spread of Pear Blight (*Bacillus amylovorus*).—V. G. J.

Pear-growing in Victoria—History and Evolution of the Pear. By E. Wallis (*Jour. Agr. Vict.* Feb. 1919, pp. 76-86).—Resistance of pear to adverse conditions, bad drainage, drought, smoke which would kill apple. A pear that is cross-pollinated is generally larger at the basal end than one which is the result of self-pollination. Pears borne on young, vigorous, or heavily-pruned trees are apt to be coarse, and deviate from true shape of the variety.—C. H. H.

Pear-Tree, Canker. By V. Enfer (*Rev. Hort.* vol. xci. pp. 217, 218).—Canker in pear-trees may be cured by scraping the diseased part and then painting the wound with a strong solution of sulphate of iron containing 1 per cent. of sulphuric acid (53° Baumé).—S. E. W.

Pemphigus populi-transversus, Life History of. By T. H. Jones and C. P. Gillette (*Jour. Agr. Res.* xiv. pp. 577-594, Sept. 23, 1918; plates).—A full description of this Aphis is given, together with its life history.

It has been proved that this species feeds on the roots of Crucifers, as well as causing galls on the leaf-petioles of some of the Poplars. The galls begin to develop in spring and increase in size during the summer. By the autumn they have often reached the diameter of nearly an inch.

The presence of the Aphis on the roots of Crucifers may be easily detected, as they cover themselves with white cottony material.

Dr. Gillette completes the paper by giving detailed descriptions of the Aphis in all its forms.—G. F. W.

Permeability, A New Method of Studying. By S. C. Brooks (*Bot. Gaz.* vol. lxiv. No. 4, Oct. 1917; pp. 306-317; with 2 figs.).—The writer describes a method of studying permeability, which depends upon the diffusion of salts or other substances through a diaphragm of living tissue, viz. portions of the frond of *Laminaria Agardhii*—one of the common sea-weeds of the New England coast.

The apparatus used consists of two artificial cells, constructed from glass tubing, containing the fluids under investigation. The two open ends of the tubes were placed together and separated by a piece of prepared tissue. Changes in concentration of the solutions in each cell were measured by determining the changes in electrical conductivity.

As the result of a series of experiments it was found—

(1) That the protoplasm of *Laminaria* is normally permeable to the salts of sea-water.

(2) Sodium salts cause an increase of permeability which culminates in death.

(3) Calcium and lanthanum salts cause a decrease in permeability, followed by an increase which culminates in death.—R. J. L.

Permeability of the Cell Walls of Allium. By S. C. Brooks (*Bot. Gaz.* vol. lxiv. No. 6, Dec. 1917; pp. 509-512).—The impermeability of the tissues of higher plants to inorganic salts has usually been attributed to the impermeability of the protoplasm to the salts used. The investigations of the writer show that in certain cases the influence of the impermeable cell wall is an important factor. He found that the exterior cell wall of the epidermis from the inner surface of onion bulb scales is slightly permeable to hydrochloric acid, while it is practically impermeable to various salts and dyes, and to caustic soda. These results were obtained by experiments conducted on the same principle and with the same apparatus as was used in the writer's experiments on *Laminaria* (vide *Bot. Gaz.* same volume; pp. 304-317).—R. J. L.

Permeability, Methods of Studying Permeability of Protoplasm to Salts. By C. S. Brooks (*Bot. Gaz.* vol. lxiv. No. 3, Sept. 1917; pp. 230-249).—The writer sets out to consider critically the methods hitherto employed in the study of permeability in order to determine which of the methods can be considered most reliable and help most towards the solution of the problem. He concludes that the steps most essential to further progress are: (1) A thorough analysis of the various disturbing factors in the methods involving chemical determinations, and the satisfactory interpretation of the results secured by such methods; (2) the same type of analysis of the methods depending on turgor, with special reference to the possible effect of exosmosis; and (3) the establishment of methods of determining progressive changes in permeability without the various disadvantages of the other methods.—R. J. L.

Physoderma Disease of Indian Corn (*Zea Mays*). By W. H. Tisdale (*U.S.A. Jour. Agr. Res.* xvi. No. 5, Feb. 1919, pp. 137-154; 10 plates).—The Physoderma disease was first discovered by Shaw (1910) and Barrett (1911). It occurs practically throughout the corn-growing areas of the U.S.A., and is particularly prevalent in Atlantic and Gulf Coast States and in the Mississippi Valley. The causal organism is *Physoderma Zeae maydis* Shaw, and its development is favoured by moist, warm weather. The sporangia of the fungus live over the winter on old diseased plants and also in the soil, and germinate the

following summer by zoospores. The sporangia require free water and 23° C. to 30° C. for germination and host penetration. The fungus is disseminated by wind and probably by other agencies—flowing water, insects, and various animals. The control measures suggested are thorough sanitation, crop rotation, and resistant varieties.—*A. E.*

Pine Blister Rust. By G. G. Hedgcock, E. Bethel, and N. R. Hunt (*Jour. Agr. Res.* xiv. No. 10, Sept. 1918, pp. 411-424; 4 plates).—The authors find that the æcial stage of the fungus *Cronartium occidentale*, which is commonly met with on *Ribes* spp. and *Grossularia* spp., is passed on the nut pines (piñons), and is given the form name of *Peridermium occidentale*.

Cronartium occidentale (n.s.) is widespread throughout the States of Colorado and Arizona. Its commonest host is *Ribes aureum*, but it occurs occasionally on *R. odoratum*, *R. inebrians*, and *Grossularia leptantha*. It has, however, been successfully inoculated on *Ribes americanum*, *R. coloradense*, *R. Giraldui*, *R. malvaceum*, *R. nigrum*, *R. glandulosum*, *R. sanguineum*, and *Grossularia inermis*, *G. missouriensis*, and *G. reclinata* × *G. hirtella*.

The peridermial stage attacks only the piñons (nut pines); though inoculations were made on twenty-three other species of pines, they have given negative results.

Cronartium occidentale differs chiefly from *C. ribicola* (white pine blister rust) in the æcial stage.—*A. B.*

Plant Growth, Effects of Barium and Strontium Compounds on. By J. S. McHargoe (*U.S.A. Jour. Agr. Res.* xvi., No. 7, Feb. 1919, pp. 183-194).—The following conclusions were arrived at:

Barium compounds, in absence of calcium compounds (CaCO_3), are poisonous to plants, but in presence of excess of CaCO_3 exert a stimulating influence upon plant growth. There is no tendency to replace calcium by barium in plant growth when calcium is omitted. Strontium compounds give larger yields than barium compounds. Strontium carbonate cannot be substituted for calcium carbonate in the growth of plants, though strontium carbonate is less toxic to plants in absence of calcium carbonate than barium carbonate. Barium or strontium are not important plant-foods, though small quantities act as stimulants in presence of calcium carbonate, and cause acceleration in growth of plant roots. By increasing the amount of strontium nitrate a corresponding increase in the nitrogen content of wheat was obtained.—*A. B.*

Plasmodiophora brassicæ, Tissue Invasion by. By L. O. Kunkel (*Jour. Agr. Res.* xiv. Sept. 1918, No. 12, pp. 543-572; 20 plates).—The author finds that cabbage plants of all ages up to one year are susceptible to club-root. The typical club-root is the result of a single primary infection, and this forms a morphological unit. The spread of the disease from points of primary infection is accomplished by plasmodia directly penetrating the cells. The cell divisions in the host plant increase the number of infected cells, but have a small part in distributing the parasite through the tissues.

Infection by direct penetration may be of four stages:

1. Primary infection of cortical tissues and penetration to the cambium.
2. Infection of the cambium in all directions from the original point of penetration.
3. Passage of plasmodia out from the cambium into the cortex, and in from the cambium towards the xylem.
4. Infection of the medullary rays.

Infection of a given cell may be temporary or permanent. If temporary it has no noticeable effect on the cell; if permanent, it stimulates the cell to abnormal growth and division. The growth stimulus is diffuse—that is, it acts on the non-infected cells as well as on the infected cells. The stimulus seems to travel in advance of the infection, specially in the infection of medullary rays and in the early stages of infection, and the disease stimulates the production of branch roots and shoots. Diseased shoots are unable to react normally to gravity. The mass of parasitic protoplasm in a given volume of diseased tissue is constant in different clubs, and in the clubs of different plants. The average volume relation between host and parasite is approximately in ratio 28 to 72. A unit volume of diseased tissue yields the same quantity of spores. The wilting of diseased plants is due, in part, to hypoplasia of cell differentiation in the xylem of the bundles, and the splitting up of the woody cylinder through infection and growth of the medullary rays.

A short bibliography is appended.—*A. B.*

Plum, A Study of Sterility in the. By J. M. Barsey (*Genetics*, vol. iv. pp. 417-488, September 1919; 5 plates).—Self-sterility tests show that varieties of the American species are self-sterile. Pollen abortion is not a cause of sterility except in rare instances where suppression is complete. Developing fruits were found to drop in three waves, which are separate and distinct in point of time and size. The first drop takes place immediately after bloom, and is caused by aborted pistils. The second from two to four weeks after bloom and includes all in which fertilization has not taken place. The third, or "June drop," follows the second by an interval of about three weeks, and in these fertilization has taken place, but embryonic development has stopped.

The suppression of one of the two ovules in each ovary was found to be typical.

Pollen development and the genetic relationship of varieties and species are also dealt with in some detail.—*A. N. R.*

Plum, The Fruitfulness of the, in relation to the weather. By M. T. Dorsey (*Jour. Agr. Res.* xvii No. 3, June 1919, pp. 103-126, 3 plates).—Unfavourable weather at blooming time may prevent completely the setting of the fruit of the plum. Rain and low temperatures are also important factors, while strong winds if prolonged prevent pollination by insects at critical times. Wind pollination is not sufficient, even under the most favourable conditions. The chief effects of low temperatures is to retard the growth of the pollen tube. The stigma is receptive for four to six days, and therefore a delay in pollination is liable to render fertilization uncertain. An analysis of the prevailing weather at blossom time shows that, each season, certain conditions can be singled out as being largely responsible for the setting (or otherwise) of the fruit. Remedial measures can be most effectively sought in suitable pollinizers which show the fastest pollen tube growth.—*A. B.*

Pollination of the Mango, The. By Wilson Popenhoe (*U.S.A. Dep. Agr., Bull.* 542, Aug. 1917; 4 plates, 1 fig.).—Some of the choice introduced varieties of mango fruit very sparingly, except in occasional seasons. The difficulty appears to be due, not to any morphological defect in the pollen, or faulty mechanism of pollination, but to a physiological cause connected with nutritional conditions as influenced by changes in soil moisture and food supplies.—*A. P.*

Pop Corn. By H. Wenholz (*Agr. Gaz. N.S.W.* vol. xxix. pp. 534-542; 8 figs.).—The large quantities of Pop Corn imported from the United States by New South Wales could with profit be raised in the maize-growing districts of Australia. Pop Corn (*Zea Mays everta*) is smaller in growth and bears smaller cobs and grain than other kinds of maize. 'White Rice' and 'White Pearl' are the best varieties for market. Six or seven grains are sown in clumps placed 3 feet apart. When the plants are about 10 inches high, the weaker growths are removed, leaving three or four vigorous plants in each clump. The corn must be fully matured before it is harvested.—*S. E. W.*

Potash in Soil-forming Minerals, The Availability of. By J. K. Plummer (*Jour. Agr. Res.* xiv. No. 8, August 1918, pp. 297-315).—The chief points brought out in this investigation are as follows:

Little difference in the solubility of potash in water is found among the common soil-forming minerals: Biotite, muscovite, orthoclase, and microcline.

Biotite and muscovite give up considerably more of their potash to solutions of carbonic acid than do orthoclase or microcline.

Lime as calcium bicarbonate does not increase the solubility of potash in any of these minerals. Pot experiments with oats, soya beans, rye, and cowpea show that these plants can extract varying amounts of potash from these minerals. Biotite is able to produce four times the amount of dry matter of oats as compared with microcline, and 66 per cent. as much as potassium sulphate. Muscovite produces nearly twice as much dry matter as orthoclase.

Lime as precipitated carbonate has not materially increased the dry matter or the potash removed from the soil by oats or rye. The dry matter in soya beans has been increased 33 per cent. when lime is used with biotite. Lime causes soya beans to remove more potash from the soil with potassium sulphate, biotite, and muscovite treatments, but does not appear to increase the solubility of the soil potash in N/5 nitric acid in any of the experiments.—*A. B.*

Potash in Soils, The Effect of Gypsum on the Solubility of. By Paul R. McMiller (*Jour. Agr. Res.* xiv. No. 1, July 1918, pp. 61-66).—Various soils in Minnesota when mixed with 1 per cent. gypsum, and raised to a point approximating the moisture equivalent and kept for three months, showed a marked increase in the content of water-soluble potash. The results of the experiments depend upon the conditions of contact between the soil and the gypsum.

A short bibliography is appended.—A. B.

Potato, Blackheart in. By F. C. Stewart and A. J. Mix (*U.S.A. Dep. Agr., Exp. Stn. New York, Bull.* 436, June 1917, pp. 321-362; 10 plates).—Our present knowledge of blackheart disease in potatoes was first made by Bartholomew, who proved that this occurs when the tubers are exposed to a temperature of 38-45° C. for 14 to 48 hours and that it is due to changes in the tissues due to imperfect respiration. By excluding the air from potatoes, blackheart may be produced at temperatures much lower than those stated above. Numerous experiments have been made by placing the tubers in sealed jars for various periods of time, and it is noticed that when the tubers are exposed to the air the moist surface turns brown, and the "flesh" changes from white to pink and finally to black. Tubers confined in sealed jars with less than ten times their volume of air are unable to do more than sprout. Different tubers show differences in susceptibility both to blackheart and surface discoloration. Tubers when deeply piled behave in a way similar to those deprived of air in sealed jars. They sprout feebly, become moist on surface, and are affected by blackheart. They are usually attacked by bacteria and fungi. The authors state that the injury following insufficient aeration is due to lack of oxygen rather than to the accumulation of carbon dioxide. The prevention of blackheart is a storage problem.—A. B.

Potato Cultivation. By Nanot and Scribaux (*Le Jard.* vol. xxxii. p. 287).—Hendrick's proposal to grow potatoes in 10 superimposed layers alternating with rich soil, enclosed in a wooden box or frame 8 ft. cube, yields very unsatisfactory results. The difficulty of maintaining a suitable degree of moisture throughout the whole mass is obvious.

E. Rousseaux (*ibid.* p. 302), after numerous experiments, condemns the method, and C. Dumur (p. 303) found that it led to failure.—S. E. W.

Potato Diseases. By D. C. Babcock (*U.S.A. Dep. Agr., Exp. Stn. Ohio, Bull.* 319, pp. 119-136; 9 figs.).—The bulletin gives a general account of the commoner diseases of the potato, and details directions in controlling their ravages in Ohio.

For convenience the diseases are classified under three heads as follows:

(i) Diseases controlled by selection of clean "seed" tubers: (a) Dry Rot (*Fusarium* Wilt), (b) Black-leg, (c) Potato Leaf-curl.

(ii) Diseases controlled by treating "seed" tubers: (a) Potato Scab, (b) *Rhizoctonia*.

(iii) Diseases controlled by spraying: (a) Late Blight, (b) Early Blight, (c) Leaf-tip Burn.—A. B.

Potato Forcing. By H. Blin (*Le Jard.* vol. xxxii. p. 270).—Seed potatoes with not less than two eyes are pressed on the surface of well-tilled ground and covered with a bed of straw, leaves, and grass, 4 or 5 inches deep, which is kept moist, but not saturated with water. When the foliage of the plants begins to fade, the covering containing the tubers is removed.—S. E. W.

Potato, Fusarium Blight of. By H. G. McMillan (*U.S.A. Jour. Agr. Res.* xvi., No. 11, March 1919, pp. 279-303; 5 plates).—Three general stages of the *Fusarium* blight are recognized: (1) The decay and death of the seed tuber before the shoot emerges from the ground; (2) the attacked seedling which shows the various symptoms of infection; (3) the mature stage, usually attacking plants of mature growth with infection and decay of the new tubers. Different varieties of potatoes show marked variation in resistance to the disease. Two methods of infection are recognized: infection from the soil of roots and root hairs, and infection of the seed tuber.

The methods of control are: (1) Selection for disease resistance; (2) superior cultural conditions for the potato plant; (3) the use of whole seed tubers free from wound or injury.

The last method is suggested as probably the best for control of the *Fusarium* blight.—A. B.

Potato Leaf-roll, Histological Studies of. By E. L. Artschwager (*Jour. Agr. Res.* xv. pp. 559-570, Dec. 1918; plates).—An investigation running counter in some ways to Quanjer's observations. Too long to abstract—the original should be consulted.—*F. J. C.*

Potato, Mosaic Disease of the. By E. S. Schultz, D. Folsom, F. M. Hildebrandt, and L. A. Hawkins (*Jour. Agr. Res.* xvii. No. 6, Sept. 1919, pp. 247-273, 8 plates).—Mosaic disease of the potato is now widely distributed over the United States, and has a very detrimental effect upon the yield. It produces characteristic symptoms upon the foliage and these may be modified or obscured by differences in environment or variety. The disease may be transmitted from plant to plant by the juice, which may be carried by at least two species of aphides. The mosaic disease has a tendency to increase the sugar contents of the leaves at the expense of the starch. Removing the "mosaic" plants before aphids become abundant is helpful in checking the disease.

A short bibliography is appended.—*A. B.*

Potato, Parasitism of *Pythium Debaryanum* (Hesse) on the. By L. A. Hawkins and R. B. Harvey (*Jour. Agr. Res.* xviii. No. 5, Dec. 1919, pp. 275-298, 3 plates).—The physiology of parasitism and the relations existing between host and parasite have been the subject of numerous investigations. The authors find that *Pythium Debaryanum* destroys the pentosans, starch, and sugar of the potato tuber; that the fungus secretes a toxin which kills the cells of the potato and that an enzyme is secreted by the fungus which destroys the middle lamellæ of the cells of the host. The cut surface of the cortex, when dried for three hours, was much more resistant to puncture than the freshly cut surface. Thus there is a co-relation between resistance to infection by the fungus, and resistance to mechanical pressure. The osmotic pressure within the fungus filament, as determined by plasmolysis, is sufficient to develop the pressure necessary to puncture the cell walls in the potato tubers in nearly every case where infection occurred. Mechanical pressure exerted by the fungus hyphæ seem to be the most important factor in cell-wall penetration by this fungus, and resistance to infection is apparently due to resistance of the cell walls to mechanical puncture. Microscopical examination and observations seem to corroborate this theory.—*A. B.*

Potato Seed. By H. A. Edson and W. Stuart (*U.S.A. Dep. Agr.*, June 1918, pp. 1-8; 4 figs.).—Seed potatoes should not be selected from the whole crop after it has been harvested. It is better to plant a special plot with a good strain, grow the plants well and eliminate weak and diseased plants and sports. Select seed from the most productive plants yielding tubers of uniform size.—*S. E. W.*

Potato Stem Lesions. By H. A. Edson and M. Shapovalov (*Jour. Agr. Res.* xiv. No. 5, July 1918, pp. 213-219; 3 plates).—The authors find that numerous species of fungi are concerned in the formation of lesions on the stems of the potato. Amongst these are several parasitic species of *Fusarium*, *Alternaria*, *Botrytis*, *Zygoryhynchus*, *Corethropsis*, *Phoma*, *Clonostachys*, *Acrostalagmus*, as well as *Rhizoctonia*. The lesions produced by these fungi are practically indistinguishable from each other under field conditions, but show certain characteristics when reproduced under control conditions in the greenhouse.

A. B.

Pruning Investigations: Second Report. By J. R. Magness, A. F. Edminster, and V. R. Gardner (*U.S.A. Exp. Stn. Oregon, Bull.* 146, Oct. 1917; 19 plates).—Contains accounts of studies in fruit-bud formation, the relation between length, angle, and diameter of shoots, and the development of side shoots and fruit spurs from lateral buds, the influence of bending dormant shoots upon their subsequent behaviour, and the relative effects of winter heading back and thinning out of apple shoots in young trees.—*A. P.*

***Pyracantha Gibbsii* var. *yunnanensis*.** By A. Bruce Jackson (*Gard. Chron.* May 31, 1919; with 2 figs.).—The right name for the plant known as *P. crenulata* v. *yunnanensis* and *P. crenulata* v. *obtusata*. It differs from the type in more spiny branches, with leaves coarsely crenate, instead of entire or finely serrate in the upper two-thirds only, and fruits maturing and lasting later.—*E. A. B.*

Pyrethrum. By W. S. Abbott (*U.S.A. Dep. Agr., Bull.* 771, pp. 1-7).—Pyrethrum powder deteriorates in the course of 12 months unless it is kept in sealed jars. The whole flower-heads are not damaged by storage.—*S. E. W.*

Radish, Wild and Cultivated. By Y. Thouard-Riolle (*Rev. Hort.* vol. xci. pp. 244-246; 3 figs.).—There is no evidence that the cultivated radish is descended from the wild radish, *Raphanus raphanistrum*. The so-called improved wild radish is a hybrid of *R. raphanistrum* and the edible radish of the garden.—S. E. W.

Raspberries. By H. F. Maxim (*U.S.A. Dep. Agr., Bull.* iii., vol. xvii. pp. 14-20).—Three types of Raspberries are grown in the States, *Rubus strigosus* (red), *R. occidentalis* (black), and *R. neglectus* (purple). The best-known native varieties of the red raspberry are 'Cuthbert' and 'Golden Queen.' 'St. Regis' is the most valuable form of perpetual-bearing raspberry. 'Cumberland' and 'Gregg' are the best black raspberries. The purple is a hybrid between the red and the black. Like the latter it is propagated by bending down the canes into the soil where the tips root.—S. E. W.

Ravenelia, Notes on New or Rare Species of. By W. H. Long (*Bot. Gaz.* vol. lxiv. No. 1, July 1917; pp. 57-66).—Three new species are described—viz. *R. Hoffmanseggiae*, found on Cassiaceae; *R. siderocarpus* and *R. prosopidis* on Mimosaceae. These fungi were collected by the author while on field work in Texas.—R. J. L.

Resin Secretion in Balsamorhiza sagittata. By E. C. Faust (*Bot. Gaz.* vol. lxiv. No. 6, Dec. 1917; pp. 441-479; 4 plates).—Resin is a by-product, formed as the result of the metabolic activities of the plant. During growth a polysaccharide, inulin, produced during photosynthesis, is broken down, causing a by-product, balsamoresene, to be produced. This resene is changed to resinic acid. On account of the probable toxic nature of the resene and resinic acid to the plant, they are translocated (largely in the form of balsamoresene) to schizogenously formed ducts of endodermal origin. Since resene and resinic acid are toxic, they may be used as a guard against mechanical and parasitic injury.—R. J. L.

Respiration: Effect of Anæsthetics upon Respiration. By A. R. C. Haas (*Bot. Gaz.* vol. lxvii. No. 5, May 1919, pp. 377-404; with 7 graphs).—The writer found that "when *Laminaria* is exposed to anæsthetics (in sufficiently high concentration to produce any result) the initial effect is an increase of respiration. This may be followed by a decrease if the anæsthetic is sufficiently toxic. No decrease of respiration is observed when the concentration is too low to be toxic."—R. J. L.

Rhododendron campylocarpum. By S. Mottet (*Rev. Hort.* vol. xci. pp. 328, 329; 1 fig.).—Interesting results may be expected from the hybridization of other *Rhododendrons* by the yellow-flowered *R. campylocarpum* from Sikkim.
S. E. W.

Root-Rot of Tobacco, Influence of Soil on. By J. Johnson and R. E. Hartman (*Jour. Agr. Res.* vol. xvii. No. 2, May 1919, pp. 41-86, 8 plates).—The root-rot disease of tobacco caused by *Thielavia basicola* is characterized by stunting of the plants, due largely to a reduced root system. This is in turn due to soil environment. From the experiments made, it appears that there is no variation in pathogenicity of the root rot fungus from different sources. The amount of the disease is determined by the susceptibility of the host, the amount of infection, and the soil factors. Root-rot is capable of developing in relatively dry soils, for increasing the moisture content of the soil up to three-fourths of its water-holding capacity does not materially increase the disease. Saturated soils are more favourable, however, for the disease than unsaturated ones. The most favourable temperature for the disease is from 17° to 23° C. Below and above this range practically no infection occurs. The disease is checked by acid soils, while a high organic matter content no doubt favours infection, and also serves as a host for the fungus. Clay seems to favour the persistence of the parasite in the soil, and may favour infection.

A short bibliography is appended.—A. B.

Root Systems: Development of Root Systems under Dune Conditions. By W. G. Waterman (*Bot. Gaz.* vol. lxviii., No. 1, July 1919, pp. 22-53; with 17 figures).—The writer concludes that, "giving due weight to the possibility of moisture, oxygen content, and penetrability of the sand as influencing factors, the evidence seems to point conclusively to nutrient or at least chemical influence as the cause of variability in symmetry in the extension of roots under dune conditions." Dune soil contains not only old soil layers but minute streaks and

patches, apparently of carbonaceous and organic origin, as well as dead plant parts, very unequally distributed. Roots react differently to these elements, extension being increased in some species by the buried organic matter, while others seem unaffected or even inhibited by it. Under certain conditions the root apparently utilizes such organic matter directly, at the expense of its shoots.—*R. J. L.*

Root Systems of certain Desert Plants. By M. S. Markle (*Bot. Gaz.* vol. lxiv. No. 3, Sept. 1917; pp. 177-205; with 33 figures).—The root systems generally penetrate rather deeply, but often have prominent laterals near the surface of the soil. The cacti and a few of the shrubs have a very superficial root system. The larger cacti show a differentiation into anchorage and absorptive roots. The plants of arroyo sides have prominent tap-roots varying in length with the height of the plant above the bottom of the arroyo. Storage roots are uncommon, and are more characteristic of the moister situations. Vegetative reproduction from roots is common in the plants of unstable soil.

The principal determining factors of root variations are variation in the penetrability of the soil and differences of moisture content.

The roots of plants of an association are grouped into rather definite layers, so that root competition is lessened. The composition of an association is probably determined largely by root competition.—*R. J. L.*

Rose Canker, Brown, caused by *Diaporthe umbrina*. By Anne E. Jenkins (*U.S.A. Jour. Agr. Res.* xv., No. 11, Dec. 1918, pp. 593-600; 3 plates).—The author describes a brown canker of roses which is commonly met with in many of the Eastern States, and which is caused by the fungus *Diaporthe umbrina*, which produces both pycnidia and perithecia. The life-history is completed in from four to fifteen days. It is not definitely known how the spores are disseminated, but rain is held to play an important part in the distribution of the exuded pycno-spores.

The control measures suggested are the use only of healthy nursery stock for planting, the removal and destruction of diseased canes, and spraying in the autumn, in the spring, and again in early summer.—*A. B.*

Rust, Can Biologic Forms of Stem, change rapidly? By E. C. Stakman, J. H. Parker, F. J. Piemeisel (*Jour. Agr. Res.* xiv. pp. 111-123; July 1918; plates).—The authors answer the question in the negative, and regard their results as indicating rust resistance as comparable with other permanent characters, and rather an hereditary character which cannot be produced by the accumulation of fluctuating variations within a susceptible line, nor broken down by changes in the host or parasite, than primarily dependent upon seasonal conditions, soil type, geographical location or other cultural conditions.

F. J. C.

***Schizophragma integrifolium*.** By S. Mottet (*Rev. Hort.* vol. xci. pp. 275-278; 2 figs.).—*Schizophragma integrifolium* is the most beautiful of the climbing Hydrangeas. It is hardy and of easy cultivation. The panicles of white flowers and cream-white bracts are very striking.—*S. E. W.*

***Sclerotium Rolfsii* (Sacc.), Recent Studies on.** By J. J. Taubenhaus (*Jour. Agr. Res.* vol. xviii. No. 3, Nov. 1919, pp. 127-139, 4 plates).—This fungus caused much loss amongst stored vegetable and fruit produce. It attacked the tomato, sweet potato, maize, and many ornamental plants, and appears to be widely distributed amongst the Southern States of America. The fungus is a true parasite, and there are no physiological strains or varieties. The size of the sclerotium in pure cultures is little influenced by the medium used, but is greatly influenced by the host. On the orange, the sclerotium is extremely large. The mycelium appear as strands or in radial fans, and growth in length takes place by a special "bud" developed at the terminal cell of the mycelium.—*A. B.*

Seed Disinfection by Formaldehyde Vapour. By C. C. Thomas (*Jour. Agr. Res.* xvii. No. 1, April 1919, pp. 33-39).—The continual introduction of plants from all parts of the world into the States emphasizes the necessity of methods of seed disinfection. The use of solutions for this purpose is not suitable, and formaldehyde vapour was used instead. It was found that many bacteria and fungi were killed by this vapour (20 oz. to 1,000 cubic feet for 2 hours), but no injurious effects were noted on any of the seeds tested. The experiments indicate that this gas is an efficient means of seed disinfection.—*A. B.*

Seeds: Possible Correlations concerning Position of Seeds in the Pod. By Byron D. Halsted (*Bot. Gaz.*, vol. lxvii., No. 3, March 1919, pp. 243-250).—This investigation was carried out by the late Professor Halsted with the Henderson Lima bean on a block of ground one-fortieth of an acre in area.

The following summary of his investigations is given:—

(1) The greatest viability in Henderson Lima beans is associated with the seeds that are borne in the middle of the pods.

(2) Three-seeded pods make up more than four fifths of the crop; three-seeded and four-seeded pods are more numerous in the second of the two field harvests of ripe pods.

(3) Seeds from the middle of the pod produce a much larger number of pods than do seeds from the base or tip.

(4) The heaviest seeds are produced in three-seeded pods and the lightest in four-seeded pods.

(5) The seed weights make a continuous rising series from the base to the tip for all types of pods.

(6) The first harvest yields lighter seeds than does the second harvest in each pod position.

(7) The seeds associated with aborts are heavier than are those in full pods in each type of pod, and each position in the pod.

(8) The abortiveness is less in the first than in the second harvest, and is least in the rows grown from seeds from the middle of the pods.

(9) Abortiveness is chiefly in the basal position and decreases regularly from the base to the tip of the pod.

(10) The position of the pod that yields the greatest weight of seed is associated with the lowest percentage of abortiveness.—*R. J. L.*

Seeds, Resistance of, to Desiccation. By George T. Harrington and William Crocker (*Jour. Agr. Res.*, xiv, Sept. 1918, No. 12, pp. 525-532).—This paper describes some experiments to determine the effect on the vitality of certain seeds when dried under varying conditions for varying lengths of time.

It was found that the percentage of germination was not materially changed when wheat, barley, Sudan grass, Kentucky bluegrass, and Johnson grass were dried to less than 1 per cent. of moisture. Even reduction to 0.17 of moisture did not affect the germination of Kentucky bluegrass and Johnson grass seed, but the vigour of the seedlings was greatly reduced. If Kentucky bluegrass seed was further dried in a vacuum oven for six hours at 100° C., the percentage of germination was not materially affected. All this controverts Ewart's statements as to the degree of drying which seeds are capable of withstanding and remaining viable, as far as the seeds used in this experiment are concerned.

A. B.

Seeds (Wolfryn Process), Report on proposed Electrolytic Treatment before Sowing. By E. J. Russell, D.Sc. (*Jour. Min. Agr.*, vol. xxvi, No. 10, Jan. 1920).—Farmers have, for the past three seasons, been offered wheat and other seed treated by an electrolytic process which, it is claimed, causes a marked increase in yield at a cost of 7s. to 10s. 6d. an acre. Previous reports from colleges and experimental stations were unfavourable in the main, while farmers made conflicting statements as to the success or otherwise of the treatment. Dr. Russell, therefore, undertook a fresh series of tests which were chiefly made in pots although field experiments were undertaken, while results are also quoted from other observers. The author comes to the conclusion that although, in a few instances (where successes, however, may have been due to other causes), increased crops were obtained, the losses are greater than the gain, and that, to say the least, the process lacks certainty. He concludes that he "is not prepared on present evidence to say that the process never succeeds, but the risk of failure seems so great that the farmer should look upon it as an adventure which may or may not prove profitable."—*G. C. G.*

Shot Borer Beetle. By C. Warburton (*Roy. Agr. Soc., England*, Sept. 1917, pp. 7).—A report dealing with the author's official visit to Evesham to investigate the damage done to Plum trees by *Scolytus rugulosus* and *Xyleborus dispar*. *X. dispar* is a wood-borer, and only the imago bores.

The chief attack is in spring when the eggs are laid. The larvæ emerge in June, and live in the "mother" cell and feed on the plant sap and a fungus growing in the tunnels.

At the end of August the beetles (nearly all females) emerge from pupæ;

the galleries being full of them. If examined in mid-winter there are fewer beetles and a larger number of males.

(1) Remove infected branches in early September and burn them.

(2) Dress the trees with (a) clay and lime, (b) soft soap and soda, or (c) clay and lead arsenate in early March.

(3) Drive newly cut oak or hawthorn stakes in between the trees, and burn them in June.

Scolytus is a bark-borer, and both larvæ and beetles bore.

There may be two or three broods in a year, and the first attack is in April or May, at its height by June, and a new brood has reached maturity in August. The holes are no larger than pin-pricks, and are not so fatal to the tree as *Xyleborus*. It will breed in timber a long time felled, so "trap trees" may be stakes of fruit trees.—G. F. W.

Slug, The Spotted Garden. By W. H. White (*U.S.A. Dep. Agr., Farm. Bull.* 595, June 1918; 3 figs.).—Describes the habits of the spotted garden slug, and explains how to rid the premises and grounds of this destructive pest. The standard remedies are lime, salt, soot, sand, and road dust. Poisoned baits of boiled potato sprinkled with arsenic are good, and it is imperative that gardens, greenhouses, and mushroom beds should be kept clear of weeds, rubbish, and other breeding grounds and hiding-places.—V. G. J.

Smyrna Fig Culture. By W. Taylor (*U.S.A. Dep. Agr., Bull.* 732, pp. 1-43, 10 figs.).—The Smyrna fig is grown in large quantities in California. It appreciates a well-drained loam, dressings of stable manure and some irrigation, and requires little pruning. As the Smyrna fig is female, it is essential that the orchards contain some Capri figs. The pollination of the Smyrna fig is effected by means of an insect, *Blastophaga grossorum*, which gains access through the eye of the fig to the female organs. This insect hibernates in the Capri fig; in fact, only a few hours of its existence are spent outside the Capri fig. In June baskets or chaplets of Capri figs are suspended in the Smyrna fig trees, to facilitate pollination. The unfertilized fruit does not develop and falls to the ground.

S. E. W.

Soil Acidity and Effects of Moisture upon it. By S. D. Conner (*U.S.A. Jour. Agr. Res.* vol. xv. No. 6, Nov. 1918, pp. 321-330).—Five different types of acid soils were kept under different moisture conditions in pots for over one year. Portions of the soils were a quarter saturated, half saturated, and fully saturated; also in an air-dry condition. The acidity determinations were made by Hopkins' KNO_3 method, Jones' calcium acetate method, and ethyl acetate method, and samples of soil from each pot were tested for acidity both in moist and air-dried condition. The author found that soil rich in organic matter showed the greatest acidity when kept fully saturated; the soils low in organic matter showed the greatest acidity when kept half-saturated. With mineral soils the fully saturated soils had much greater amounts of soluble manganese than the other samples. There is less soluble aluminium in fully saturated mineral soils, but with soils high in organic matter this does not hold. Calcium, magnesium, and silica showed variations in solubility owing to different moisture conditions, but the variations are not so marked as those of iron, manganese, and aluminium. In correlating the soluble iron and aluminium with the acidity obtained from KNO_3 extracts, the titrated acidity is partly due to soluble acid organic compounds. The acidity varies under different conditions of moisture and aeration, and these variations are due to chemical rather than physical changes in the soils. Acidity in humid soils is produced by the leaching of strong basic elements in drainage water, by removal of bases in crops, by the decay of carbonaceous and nitrogenous substances, and by the hydrolysis of mineral compounds and organic matter.—A. B.

Soil, Ammonification of Manure in. By H. J. Conn and J. W. Bright (*Jour. Agr. Res.* xvi. No. 12, March 1919, pp. 313-350).—The importance of ammonification process in the soil has long been recognized, though there is a tendency to regard it as of secondary importance to nitrification in soil fertility. The present paper is an attempt to determine the organisms which cause the ammonification of manure in soil under natural conditions, and to compare them with other organisms known to possess this power under laboratory conditions. The authors find that the non-spore-forming bacteria are most active in manured soil, and of these *Pseudomonas fluorescens* (Flügge) Migula and *P. caudatus* (Wright) Conn are the most active. Pure cultures of both organisms multiply much more rapidly in sterilized manured soil than do pure cultures of *B. cereus*

(Frankland), a typical spore forming bacterium, and the two *Pseudomonas* forms soon attain an ascendancy.

In field soil where no organic matter has been added for many years *P. fluorescens* and *P. caudatus* are rarely found, but *B. cereus* is common. All three organisms are vigorous ammonifiers when tested in pure culture.

Pseudomonas fluorescens has been compared with other fluorescent forms isolated from the soil, but definite limits cannot be fixed for this species. *Pseudomonas caudatus* is similar to the "orange-liquefying type" previously described by one of the authors, and appears to be identical with the organism described by Wright (1895), and it is commonly found in soil and water.

A short bibliography is appended.—*A. B.*

Soil Factors affecting the Toxicity of Alkali. By F. S. Harris and D. W. Pittman (*U.S.A. Jour. Agr. Res.* vol. xv. No. 5, Nov. 1918, pp. 287-319).—The authors' conclusions, based upon some thousands of determinations of the effects of alkali salts on plant germination and growth under different conditions, were as follows:

The size of the particles of sand, independently of other factors, does not seem to influence appreciably the toxicity of alkali.

Loam soils are more tolerant of alkali than either sand or clay; the coarser loams are more tolerant than the finer ones at the same moisture content, but if the heavier loams are maintained at an equivalent moisture content they are more tolerant. Organic matter increases the resistance to alkali when the soil containing it is given sufficient moisture, but where present in large quantities organic matter decreases the resistance if the moisture supply is low. The toxicity of sodium chloride and sodium sulphate seems to depend on the relation between concentration of salt and percentage of moisture present, while the toxicity of sodium carbonate is more largely affected by the presence of organic matter. Organic matter has the apparent power to remove sodium carbonate from the soil solution in large quantities. This probably explains why, when sodium carbonate is added to a loam soil, it is less toxic than sodium chloride, while in field studies where the salt is determined by analyses, and in solution and in sand cultures, the sodium carbonate is more toxic.

Loam soils and soils with a high water holding capacity may be successfully farmed at a higher alkali content than others. Soils in which alkali reduces crop results should be kept as moist as possible. Manure or other organic matter should be beneficial to alkali soils, especially those high in carbonates.—*A. B.*

Soil Reaction and Growth of Azotobacter. By P. L. Gainey (*Jour. Agr. Res.* xiv. pp. 265-272, August 1918).—*Azotobacter* was found to exist in soils containing none or only traces of calcium carbonate, and also in soils showing some acid reaction, the latter being a more important check than the presence of calcium carbonate an encouragement. The paper should be consulted for details.

F. J. C.

Soil Reaction, Influence on Nitrogen-assimilating Bacteria. By E. B. Fred and A. Davenport (*Jour. Agr. Res.* xiv pp. 317-336, August 1918).—The nodule-forming bacteria were found to vary according to their host-plant in their powers of resisting acid concentration in the soil. *Azotobacter* was found to be much more sensitive to alterations in reaction of the soil than are the nodule bacteria, a concentration of acid represented by N/1333·3 being fatal.—*F. J. C.*

Soil Solution as an Index of the Biological Changes in the Soil. By J. F. Morgan (*U.S.A. Exp. Stn. Mich., Tech. Bull.* 39, Sept. 1917, pp. 24: 9 tables, 6 figs.).—The soil solution as obtained by the oil-pressure method was discussed in a previous Bulletin, No. 28. The writer now attempts to show the value of such a soil solution for the study of the microbial changes that are believed to be the essential factors in fertility. In the experiments, soils were treated with several organic manures: dried blood, tankage, cotton seed meal, bone meal, and hoof meal; and also with ammonium sulphate and sodium nitrate. The soil solutions from the treated soils were more concentrated than from untreated (control) soils, due to the decomposing organic matter added. The dried blood gave quicker results than the other organic substances. Nitrification is well illustrated by the study of solutions obtained by extracting at definite intervals soils similarly treated. The treated soils contained more micro-organisms than the controls, indicating that when more food for the bacteria is added these organisms will multiply to take care of the increased work demanded of them. The only change in the nitrogen cycle that could be expected when ammonium sulphate and sodium nitrate were added would be the nitrification of the former and denitrification of the latter.

The bone meal and hoof meal gave a slight increase in phosphoric acid (PO_4). The hoof meal yielded more nitrate than the bone meal.

Decomposition of dried blood was found to take place more rapidly in open sandy soil than in close-textured soil (heavy silt loam).

The writer concludes that the soil solution obtained by this method furnishes a better means than other methods of studying what is lacking in the soil for the plant.—*F. G. A.*

Soils, Oxidation of Sulphur in. By O. M. Shedd (*Jour. Agr. Res.* xviii. No. 6, Dec. 1919, pp. 329-345).—The author found that comparatively large amounts of added sulphur are easily oxidized to sulphuric acid in the soil, and it appears that this acid would act upon the rock phosphate when present and convert it into a water-soluble form. The time of contact of the sulphur, soil, and rock phosphate was about 10 weeks. Further experiments with rock phosphate, sulphur, soil, and manure show, after 24 months, that about 17 per cent. and 84 per cent. of the total phosphorus had been converted into a water-soluble and ammonium citrate-soluble form respectively. This does not proceed as rapidly as when an inoculation is made with a sulphofying organism. When this is added, the time is reduced nearly one-third. Nitrification can proceed regardless of the acid formed by the sulphur oxidation. The amounts of nitrogen found to be nitrified was about 20 per cent. of the total. Sulphofication was found to take place in all soils examined. When 25 and 50 mgrms. of sulphur were added to 100 grms. of soil, about the same percentage of the total was oxidized in a given time. The best conditions to promote the reaction are initial inoculation, high temperature, thorough aeration, and moisture. The acid phosphate made by this procedure was equal to the commercial product, as far as physical condition is concerned. It is possible that, by further simplification of the process, it may prove of immediate practical application.—*A. B.*

Soils, Rarer Elements in. By W. O. Robinson, L. A. Steinkoenig, and C. F. Miller (*U.S.A. Bur. of Soils, Bull.* 600, Dec. 1917, pp. 1-28; 3 figs.).—Some of the rarer elements closely resemble the commoner ones in chemical reaction. Vanadium resembles phosphorus, rubidium resembles potassium. If a certain element, present in small amounts only, is absorbed by a particular species of plant in relatively large quantities and occurs in other plants in traces only, it is reasonable to assume that the element has some physiological function. In the present paper, titanium, vanadium, chromium, molybdenum, barium, strontium, lithium, rubidium, cesium, have been determined in soils and in certain plants. Lithium was found in spectroscopic quantities in all plants examined. Rubidium was present in majority of cases. Cesium was found in ash of timothy, raspberry, and beet from certain areas. Chromium was occasionally found in very small quantities only. Vanadium was found in six cases as traces only. Molybdenum was not found in any of the plants studied. Barium was present in all cases, but strontium was only found in peas, tomato, wheat, alfalfa, not in beans. Titanium was present in small quantities in all cases, while aluminium was found in large quantities in all but two instances.

There is no evidence that vanadium replaces phosphoric acid in its functions in plants. Rubidium and cesium are apparently absorbed by the plant when present in soil solution. There is no evidence to show that any of these rarer elements are of value as fertilizers.

Details of analytical methods are set out as an appendix.—*A. B.*

Soils, Relationship between the Unfree Water and the Heat of Wetting of, and Its Significance. By G. J. Bouyoucos (*U.S.A. Exp. Stn. Mich., Tech. Bull.* 42, Mar. 1918, pp. 23; 3 tables).—The writer finds that there exists a real relationship between the "combined water" in the soil, i.e. the water which refuses to freeze even at $-78^\circ\text{C}.$ and the "heat of wetting" of the soil (i.e. the heat generated by the addition of water to dry soil). The magnitude of the heat of wetting is generally very large, especially in some clay loams and clays, where it was found to be over 400 calories, and in peat over 1100 calories, per 50 grams substance. This comparatively tremendous amount of heat represents energy expenditure at the expense of the water only, and is the result of the water undergoing a transformation from its liquid state of aggregation to a solid state of aggregation.

The difference in the heat of wetting of soils and various artificial materials in different liquids indicates that the attraction or affinity of the different solid materials for the different liquids is specific or selective.

It appears to be generally true that when a solid material is immersed in a liquid for which it has only a small attraction or affinity, and a second liquid

is added for which the solid material has a great attraction or affinity, the second liquid will be attracted by the solid material with as much force or manifestation of heat as though the first liquid were not present at all. The converse of this is not true. The remarkable phenomenon of the attraction of a solid material being exerted for a liquid through an enveloping solid or highly compressed film of another liquid throws an abundance of light on understanding the possible mechanism in the reaction between soils and soluble salts or their ions.

As to whether the "combined water" is chemically or physically combined, it appears that it exists partly as water of hydration and partly as water of solid solution, with probably the former predominating. It may, however, exist all as water of solid solution, but not all as water of hydration. If we accept the recent theory that all interatomic or intermolecular forces should be regarded as strictly chemical, including such forces or phenomena as surface tension, evaporation, cohesion, adsorption, condensation, &c., then all the "combined water" is chemically combined.

The results obtained seem to necessitate a complete and radical change of many of the present conceptions regarding soil moisture. The present ideas regarding the forms of water in the soil, the movement of moisture, the rate of evaporation, the available and non-available moisture, must all be changed.

There is also a close relationship between the "unfree water" (that which fails to freeze at $-1.5^{\circ}\text{C}.$) and the wilting coefficient of soils. The amounts of the combined water and the unfree water were ascertained by the dilatometer method.—*F. G. A.*

Soils, Salt Contents of, Determination by Freezing-point Method of the. By G. J. Bouyoucos and M. M. McCool (*U.S.A. Jour. Agr. Res.* xv. No. 6, Nov. 1918, pp. 331-336).—The freezing-point method is held to be an excellent means of determining the absolute salt content of soils with considerable accuracy. Formerly the method was restricted to the determination of the actual concentration of soil solution at different moisture contents, but now the method may be used to measure the absolute salt content of soils, and thus affords a means of comparison of the absolute salt contents of soils. The salt contents of soils depend upon the following factors: (1) season of the year in which the soil is collected; (2) amount of rainfall and length of period since rainfall; (3) temperature and rate of evaporation; (4) cultural conditions; (5) depth. The comparative study of the absolute salt content may be determined in the following manner. The soils are air-dry first; then a 15 gm. sample is taken and placed with 10 c.c. distilled water in a freezing-tube. The soil is stirred, allowed to stand, and its freezing point depression noted. For this determination the tube is placed in an ice mixture at $-2.5^{\circ}\text{C}.$, and the soil is stirred with a Beckmann thermometer until the temperature falls to about 1° above zero point. It is then left undisturbed until temperature falls to $.5^{\circ}$ below zero, when the soil is again stirred to cause solidification. When this takes place, the tube is taken out of the ice mixture and placed in an air-jacket in same bath, and the freezing-point read by means of a lens. This determination of the freezing point can be easily completed in about ten minutes.—*A. B.*

Soils, Soluble Salt Content of, and Some Factors affecting it. By M. M. McCool and C. E. Millar (*U.S.A. Exp. Stn. Mich., Tech. Bull.* 43, Nov. 1918, pp. 47; 34 tables, 4 graphs).—Describes a large number of experiments made by means of the freezing-point method. The chief conclusions are as follows:

The translocation of salts in the soil is due mainly to water movements. When large quantities of salt are present there is a movement to areas of lower concentration even when water movements are prevented. Higher water contents of the soil aid this movement. It is probable that plants are supplied with food elements by diffusion from local areas around the roots only. The accumulation of soluble salts on the surface of uncropped areas indicates that, when water movements occur in the soil, salts are carried along with them.

As a result of laboratory studies, it appears that the constituents of soils which have been cropped for a long period of years go into solution at a somewhat slower rate than do those of the corresponding virgin soils. The rate of solution of the soils studied was governed to some extent by temperature, and the moisture content had a marked influence on the rate of solubility. It is probable that biological activities play an important rôle in these phenomena.

Usually, under laboratory conditions, the concentration of the soil solutions, at all water contents, was lower after thirty days than after ten days. This may be due to reabsorption of the soluble material by the soil, to the utilization of the salts by organisms, and to the formation of less soluble compounds.

The concentration of the soil solution varied somewhat with the seasons, rainfall, different depths of the soil, and with plant growth.

It is probable that the variations in the concentration of the soil solution, in some instances at least, have not been sufficiently considered in biological studies where conclusions have been drawn based upon the results obtained from studies of the water extracts of soils. Moreover, it does not seem possible to determine the fertilizer needs of soils by obtaining water extracts and growing plants therein.

The seasonal variation in the soluble salt content of soils doubtless plays an important rôle in the results obtained from the use of fertilizers. Additional information will be presented later.—F. G. A.

Soils, Variation in Water Content of. By J. C. Martin and A. W. Christie (*Jour. Agr. Res.* xviii. No. 3, Nov. 1919, pp. 139-144).—The question of the effect produced on water soluble matters by variations in the moisture content of soils is an important one. It was found that the moisture contents approaching the air-dry condition show a decided tendency to depress the nitrates and potassium in both soils tested, and the sulphates in silty clay loam soil. These depressions are reflected in the total dissolved material. The excess water in sandy loam soil causes a disappearance of nitrates, and also depresses the potassium, calcium, and magnesium; these losses being reflected in the total solids extracted. Considerable variations in moisture contents of soils, provided the saturation point is not reached, do not appreciably modify the results obtained by the water-extraction method.—A. B.

Sowing various Crops, Factors affecting the Depth of. By F. S. Harris and H. J. Maughan (*U.S.A. Exp. Stn. Utah, Bull.* 164, Sept. 1918, pp. 18; illus., 12 figs.).—A review of other investigators' experiments shows that the largest number of plants and the largest yield were usually obtained from sowing seeds 1 to 2 inches deep. The present experiment was made with *Triticum sativum*, *Avena sativa*, *Zea Mays*, *Hordeum vulgare*, *Medicago sativa*, *Pisum arvense*, *Phaseolus* sp., *Beta vulgaris*, and *Sorghum vulgare*.

Between 1 and 8 inches the depth of sowing seemed to have little effect on the germination of most kinds of seeds, but the highest germination usually occurred from 3 to 5 inches deep, especially for the seeds most affected by depth of sowing. Deep seeding retarded the growth of small seeds and those having poor germinating power more than it did the growth of larger seeds. The plants usually grew faster when the seeds were sown from 1 to 2 inches deep. This rapid growth was especially noticed with the roots, and is no doubt one of the primary reasons for a larger yield from shallow sowings. In general, the height above the soil decreased as the depth of sowing increased. The largest growth above ground never occurred from seeds sown deeper than 3 inches. Small seeds sown below 3 inches failed to reach the surface in twenty days.—F. G. A.

Soya Bean, A Bacterial Blight of. By F. M. Coerper (*Jour. Agr. Res.* vol. xviii. No. 4, Nov. 1919, pp. 179-194, 8 plates).—This paper described a new bacterial blight, *Bacterium glycineum* (n.sp.), which attacks the leaves of the Soya Bean. The disease forms small angular spots, which in the early stages are translucent, but darken as the disease develops and finally drop out. The spots are found also on the petioles and pods, and stems. *B. glycineum* is a rod form, motile, with 1 or more flagella, and forms cream-coloured colonies on agar plates; non-liquefier; best growth at 24°C.; is sensitive to desiccation, and appears to lose its pathogenic character when grown in artificial culture. It is able to attack plants, and to enter the parenchyma without wounds in the epidermis of the plant.—A. B.

Spinach Blight and the relation of Insects to its Transmission. By J. A. McClintock and L. B. Smith (*Jour. Agr. Res.* xiv. pp. 1-60; July 1918; plates).—Spinach Blight is characterized by mottling and malformation of leaves and stunting of growth. No specific organism was found associated with the disease, but sap from diseased plants was found to be infectious and to reproduce the disease in healthy ones. The disease is probably not transmitted by the seed, nor through the soil; aphides, however, especially *Macrosiphum solanifolii* are found to carry it and to remain infectious for a long time, especially in the adult stage. The control of aphides is therefore regarded as the most promising method of dealing with the disease. The symptoms described are similar to those often observed in England.—F. J. C.

Spinach, Physiological Studies of Normal and Blighted. By R. H. Ince, O. F. Black, J. W. Kelly, H. H. Bunzell, L. A. Hawkins, S. L. Jodidi, and E. H. Kellogg (*Jour. Agr. Res.* xv, pp. 369-408; Nov. 1918).—Carbohydrates accumulate in leaves affected by spinach blight more than in normal leaves. This is not due to inability to make proteins. It is thought that denitrification occurs in blighted tissues, so that part of the nitrogen absorbed is lost as nitrogen or ammonia.—F. J. C.

Strawberry Diseases. By N. E. Stevens and R. B. Wilcox (*U.S.A. Bur. Pl. Industry, Bull.* No. 686, pp. 1-16).—*Rhizopus nigricans* is the most important strawberry-rot after picking the fruit. Berries picked in early morning are less liable to this disease. Cooling the fruit in transit is suggested.

Botrytis is a field-rot of strawberries, especially in damp fields. The diseased berries are easily recognized and should not be included in fruit intended for market. *Botrytis* is able to grow at low temperatures and produces abundant spores. It is, however, of minor importance as a cause of loss in transit due to decay.—A. B.

Taxodium and Glyptostrobus. By Sir E. G. Loder (*Gard. Chron.* Nov. 22, 1919; p. 259, with 7 figs.).—Deals with the synonymy of the American *Taxodium distichum* var. *imbricarium* Sargent (var. *pendulum* of common use), and the Chinese *Glyptostrobus sinensis* Henry, better known as *G. heterophyllum*. Certain differences and likenesses are described. The Chinese plant is but little grown in Britain, the American one being oftener planted for it.—E. A. B.

Thrips, The Pear. By A. E. Cameron and R. C. Treherne (*Agr. Dep. Canada, Bull.* 15, May 8, 1918; pp. 7-51, 22 figs.).—A full description of the life-history of the Pear Thrips (*Toxothrips inconsequens* Uzel) and remedies for combating this serious pest in British Columbia. Prunes, plums, and cherries are more seriously attacked than apples and pears, and the most serious damage is effected on the buds just after bursting and before flowering.

The insect measures $\frac{1}{8}$ inch, and is seen from the end of March in large numbers on the opening buds after migrating from the soil.

The eggs hatch in five to seventeen days.

The larvæ remain about three weeks on the trees, and when mature fall to the ground and enter any crevice.

They often penetrate quite deeply, usually 6-10 inches, and remain in the soil three to four months before changing to prepupæ in their earthen cells.

This prepupal condition only lasts seven to ten days, and they then turn to true pupæ, remaining as such for six to eight weeks.

During November the pupæ become imagoes and remain in the soil for about five months, and the following late March they emerge from the soil to the trees.

There is only one generation a year.

Spraying against the adult Thrips is more important than against the larvæ, and two sprays should be put on before the blossoming, and should be done when the Thrips are seen to be running on the outside of the buds. The first spray should consist of miscible oil No. 2, 2 gallons; nicotine sulphate, 1 pint; water, 200 gallons; and the second spraying should consist of whale-oil soap, 10 lb.; nicotine sulphate, $1\frac{1}{2}$ pint; water, 200 gallons, and both washes should be put on at 170-200 lb. pressure to ensure success.—G. F. W.

Tobacco, Angular Leaf-spot. By F. D. Fromme and T. J. Murray (*U.S.A. Jour. Agr. Res.* xvi, No. 8, Feb. 1919, pp. 219-228; 3 plates).—A leaf-spot disease of tobacco which was prevalent in Virginia in 1917 has been described as "Angular Leaf-spot." The disease is caused by a bacterium, *B. angularum*, which is a new species. It is a short rod with rounded ends, $2.5 \mu \times 2$ to 2.5μ , motile by tuft of flagella at one pole, stains readily in ordinary dyes, is Gram negative and not acid-fast, forms round, smooth, white colonies on agar, liquefied gelatine, and is aerobic.

Rainfall is an important aid to infection, and the development of the organism within the tobacco leaf is dependent on those predisposing factors which promote the rapid vigorous growth of the host. The disease produces much loss in both yield and grade, in some cases 20 per cent. reduction in yield, and 40 per cent. reduction in grade of the crop.

A short bibliography is appended.—A. B.

Tobacco Strains resistant to Root Rot. By James Johnson and R. H. Milton (*U.S.A. Bur. Pl. Ind., Bull.* 765, April 1919, pp. 1-12).—The Root Rot disease is caused by *Thielavia basicola*, and this attacks the roots of numerous varieties of tobacco, causing much damage to the crop. It is commonly spread

by transference of "sick" soil, by wind, water, or animals to "healthy" soil; or by transplanting diseased plants from infected seed-beds.

Of two varieties of tobacco ('Connecticut Havana' and 'White Burley') planted side by side in fresh soil, the Burley variety produced a much greater yield, plant for plant, than the Havana variety, but the opposite holds good if the two varieties are planted on soil which has already carried a crop or two of Burley in previous seasons. Efforts have been made to produce resistant varieties, and the paper describes experiments with various types of tobacco. The drooping leaf varieties of Burley are recommended for this purpose.—A. B.

Tomato Diseases. By C. C. Brittlebank (*Jour. Agr. Vict.* April 1919, pp. 231).—Seven diseases of tomato plants are found in Victoria:—

Leaf-mould or Target spot (*Alternaria solani* E. et M.).

Leaf-spot, Rust or Leaf Blight (*Septoria lycopersici* Speg.).

Wilt or Sleepy disease (*Fusarium solani* (Mart.) Sacc.).

Sclerotium disease (*Sclerotinia*).

Root-rot (*Rhizoctonia solani* Kuhn).

Irish potato blight (*Phytophthora infestans* De Bary).

Brown-rot or Wilt (*Bacillus solanacearum*).

Also a new tomato disease, "Spotted Wilt," which has appeared within the last three years, which is carefully described. In the summary it is thought to be identical with one which American plant pathologists have had under investigation as a troublesome disease in winter tomatoes.—C. H. H.

Tomato Diseases in Ohio. By J. G. Humbert (*U.S.A. Dep. Agr., Exp. Stn. Ohio, Bull.* 321, pp. 159-196; 12 figs.).—The following diseases of the tomato are described:—

Damping off (*Rhizoctonia*, *Pythium*, *Fusarium*), stems and roots attacked. Fusarium Wilt (*Fusarium lycopersici*), roots and stems attacked. Bacterial Wilt (*Bacillus solanacearum*), roots and stems attacked. Stem Rot (*Sclerotinia Libertiana*), stems near ground are attacked. Leaf Spot (*Septoria Lycopersici*), leaves turn yellow. Early Blight (*Alternaria Solani*), leaves become blotched. Late Blight (*Phytophthora infestans*), leaves turn black. Anthracnose (*Colletotrichum phomoides*), fruit spotted. Rot (*Botrytis* sp.) (fruit rot). Nematodes (*Heterodera radiculicola*), swollen knots on roots.

The control measures include soil sterilization, rotation of crops, spraying and ventilation.—A. B.

Tomato Products. By B. J. Howard and C. Stephenson (*U.S.A. Dep. Agr., Bull.* 581, pp. 1-24).—The use of unsound material in the manufacture of tomato products is revealed by the number of moulds and other micro-organisms when examined under the microscope. Tomato pulp stored in barrels invariably shows a large number of moulds. This indicates that it is inadvisable to use barrels for storing tomato pulp.—S. E. W.

Tomatos, Pollination. By A. G. B. Bouquet (*U.S.A. Dep. Agr., Exp. Stn. Oregon, Bull.* 158, pp. 1-29; 5 figs.).—The yield of tomatoes grown under glass is largely increased by artificial pollination. The best system is to apply pollen collected on the first and second fingers of the left hand, to the pistils of emasculated flowers. Those flowers are selected for pollination which have fully opened and later closed their petals. The petals and stamens are removed by the thumb and third finger of the left hand, leaving the pistil exposed to receive the pollen. Pollination is carried out every third day when the air of the house is dry. The increased yield of fruit amply repays the cost of extra labour for pollination.—S. E. W.

Tomatos, Stripe Disease of. By S. G. Paine and W. F. Bewlay (*Jour. Min. Agr.* vol. xxvi. No. 10, Jan. 1920).—The disease known as "Stripe" is very common in tomato nurseries and causes considerable losses, sometimes a total loss in badly infected houses. The symptoms are characteristic and consist of brown stripes on the stems, brown sunken patches on the fruit and brown shrivelled areas on the leaves. It frequently occurs in the seed-bed and necessitates fresh sowings, but commonly does not show itself until the tops are developed.

The plants are generally attacked underground, the causal organism being introduced through wounds made by insects, but parts above ground may also be infected through insect bites or infected pruning-knives,

The causal organism is a small yellow bacillus closely related to, if not identical with, *Bacillus Lathyri*, which causes a similar disease in the sweet pea. It travels up the stem, in pith adjacent to the vascular bundles, and thence to affected parts, including the fruit. In this way the seed is infected either by direct infection, or by the organism being dried on the seed coat. The resistance of the varieties differs, 'Kondine Red' and 'Comet' being more affected than 'Ailsa Craig'; but susceptibility varies with manurial treatment, excessive nitrogen and lack of potash lowering resistance, and increase of potash raising it.

Remedial measures depend on above facts, and suggestions made include (1) growing of more resistant varieties, (2) sterilisation of soil, (3) avoidance of excessive nitrogen and deficiency of potash, (4) care in pruning, and (5) care in cultivation.—G. C. G.

Transpiration: Relative Transpiration of Coniferous and Broad-leaved Trees in Autumn and Winter. By J. E. Weaver and A. Morgensen (*Bot. Gaz.* vol. lxviii. No. 6, Dec. 1919, pp. 393-423; with 18 figs.).—The autumn transpiration losses are practically the same for both deciduous and coniferous trees. Decrease in transpiration rate in broad leaved trees, due to leaf-fall, is gradual, and not unlike the decrease shown by conifers at the corresponding season. During the winter, the amount of water transpired from the defoliated stems of deciduous trees is very much the same as from the evergreen conifers. "The winter losses from conifers are only $\frac{1}{2}$ to $\frac{1}{3}$ as great as those of autumn."—R. J. L.

Truffle-growing. By F. de Castella (*Jour. Agr. Vict.* Aug. 1918, pp. 496).—Vines in the drier situations, where the yield of fruit is poor, are being replaced by evergreen oaks. It is on the roots of this tree that this valuable fungus lives as a parasite, forming the tubers, or truffles, which were worth 13s. per lb., though in years of plenty the price falls to about one-third of this price. Small trees, 4 to 8 feet high, often bear a truffle on their roots of up to 1 lb. in weight. Being underground, the tuber can only be located by the keen sense of smell of pigs or dogs; both animals are used for the purpose.

C. H. H.

Udo. By R. de Noter (*Le Jard.* vol. xxxiii. p. 361).—Udo (*Aralia cordata*, *A. edulis*) is grown in large quantities in China and Japan, where it is a favourite vegetable on account of its delicious flavour. The roots are planted in autumn in trenches on a layer of manure covered with soil and the trench is half-filled with good light soil. In January a top-dressing of well-rotted manure is applied and the plants are earthed up. In March and April the earth is removed and the large roots cut and gathered for use. Udo comes into full bearing in its second year.—S. E. W.

Vanilla Fruits, Influence of Foreign Pollen on Development. By T. B. McClelland (*Jour. Agr. Res.* xvi. pp. 245-252; March 1919; plates).—Two types of vanilla pods are of economic importance in Porto Rico—those of *Vanilla planifolia* and of 'Vanillon.' The former are the better, but the shorter thicker pods of the latter type are the easier to deal with, since they do not split open if left too long curing. The form of the fruits was found to differ according as to whether they were pollinated from flowers of the same form or of different forms, and the author considers this to be the result of different lengths of pollen tube being produced by the different forms, and consequently ovules in different parts of the fruits being fertilized.—F. J. C.

Vegetable Pests, Two Important. By W. H. Brittain (*Coll. of Agr., Truro, N.S.*, Cir. 26, Dec. 1917, pp. 3-6; 2 plates).—Brief life histories are given of the Potato Stem Borer, *Gortyna*, *Hydroecia micarea* Esp., and the Zebra Caterpillar, *Ceramica picta* Harr. The former insect attacks potato, corn, rhubarb, sugar beet, docks, &c., by the larvæ boring into the stems, causing wilting and death.

Control measures are (1) the eradication of all weeds, (2) Rotation of crops, and (3) picking and destroying the larvæ. The latter pest is very injurious to turnip, potatoes, beets, mangolds, beans, peas, &c., by stripping the plants of their leaves. Remedies advised are (1) the handpicking of leaves with egg-masses and young larvæ attached, or (2) dusting the plants with arsenate of lime or lead diluted with 8-10 parts of hydrated lime, and the larvæ must be treated when young.—G. F. W.

Verbena venosa. By C. Bellair (*Rev. Hort.* vol. xci. pp. 387, 388).—The seed of *Verbena venosa* germinates very slowly, but the germination may be expedited by one of the following expedients :—

Immersion in boiling water for one minute.

Immersion in water at 55° C. for five minutes.

Keeping the seed moist with a 0·2 per cent. solution of sodium nitrate or ammonium sulphate for 48 hours.

Arranging the seed in layers between fine sand in flower-pots for five months before use.—S. E. W.

Vinifera Grapes in New York. By R. D. Anthony (*U.S.A. Dep. Agr., Exp. Stn., New York, Bull.* 432, pp. 82–105; 5 plates, 1 col. plate).—Although the European Grape has been grown in California for 200 years, it is only in the present century that it has been cultivated with success in the Eastern States. The cuttings of *Vitis vinifera* are grafted on *V. riparia* or other phylloxera-resistant variety. Before winter the vines are pruned, freed from their supports and bent down and covered with six inches of soil to protect them from frost.

The best varieties for table use are 'Bakator,' the 'Chasselas' group, 'Lignan Blanc,' 'Muscats,' 'Gray Pinot' and 'Rosaki.' The 'Pinots' are good wine grapes and 'Teinturier' is valuable in the manufacture of unfermented grape juice.—S. E. W.

Water-holding Capacity of a Soil, Influence of Organic Matter upon. By F. J. Alway and Jos. R. Neller (*U.S.A. Jour. Agr. Res.* vol. xvi. No. 10, March 1919, pp. 263–278).—The paper details the result of a study of the moisture conditions found in two adjacent plots in Minnesota, both of which had a silt-loam soil, uniform in texture, but differing widely in content of organic matter. It was found during the cool wet summer of 1915, when cultivated crops were grown, the surface foot and this alone showed a very marked difference in the moisture content; the soil containing much organic matter retained a greater amount of water. In the warmer, drier summer of 1918, when winter rye was used, much smaller differences were found. It is concluded that in a fine-textured soil, with a fine-textured subsoil and a level surface, the difference in water-holding capacity, which may be caused by manuring or in cultural operations, exerts but little influence upon the productivity of the soil.—A. B.

Winter Moth. By J. Lochot (*Rev. Hort.* vol. xc. pp. 173–174).—The Winter Moth is destroyed by grease-banding the fruit-trees in October and spraying with lead arsenate or Burgundy mixture before the buds open in spring, and again after the fruit has set.—S. E. W.

Wireworms, Genus Agriotes, On the Life History of. By A. W. Rymer Roberts (*Ann. App. Biol.* vi. Dec. 1919, pp. 116–135, 5 figs., 1 plate).—This paper gives an account of the biology and life history of Agriotes, and is important as a contribution to the knowledge required to attack this pest by some adequate insecticide. The eggs are laid near the roots of grasses, and such an environment is only provided by grass land, waste, or badly cultivated land where couch and other grasses are allowed to grow. Very full accounts are given of the habits of adults, pupæ and larvæ, and their method of attack.

Wireworms can undergo long periods without food, and the idea of a starvation crop, such as Mustard, often proves useless in stamping this pest out.

Natural enemies are given as far as is known. Gulls have proved to be the most useful bird, and skylarks and pheasants are also given as allies in certain districts.

Proctotrupids, possibly *Phaenoserphus fuscipes*, have been hatched from *Athous haemorrhoidalis*.

A fungus, of the genus *Isaria*, is probably parasitic on Wireworms.

G. F. W.

Yield of Pear and Apple Trees in Victoria. By E. Wallis (*Jour. Agr. Vict.* April 1919, p. 209).—Estimate in 1910–11, 1·76 bushels a pear tree, 1·07 an apple tree; in 1913–14, 1·42 bushels a pear tree, 1·09 an apple tree.—C. H. H.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JANUARY 14, 1919.

Field-Marshal Lord GRENFELL in the Chair.

Fellows elected (113).—C. H. Ashley, Lt.-Col. E. Barnardiston, Miss E. Bar-
ringer, Capt. R. Billingham, F. H. Brayley, A. Brooks, Mrs. J. W. Burgess, P. J.
Burkle, E. M. Burnett, Miss M. Butcher, Mrs. A. M. Cave, Major G. F. Clarke,
W. B. Clarke, L. Cleverly, P. Cole, J. T. Collins, Miss E. F. Collins, Capt. A. H.
Coltart, J. Connell, Mrs. E. M. Cooke, H. V. Cornish, F. Cox, E. T. Davies,
Miss H. Davies, E. A. Dennis, Mrs. De Roemer, H. O. Dixon, Mrs. R. Dixon,
H. J. Drake, Miss M. K. Druce, J. J. Dudley, Dr. G. J. Eady, Lady Earle, W. H.
Ecroyd, Miss Eggers, Miss E. Elias, Miss B. K. Fell, A. G. Forbes, Miss M. Foster,
C. M. Frame, W. G. Francis, J. Glavin, Mrs. Gordon, J. F. Gough, Miss M. L.
Harland, Rev. G. H. Harries, W. J. Hatford, Sgt.-Major A. J. Haysom, Mrs. M. C.
Heath, Miss A. B. Hick, Miss P. E. Hill, E. Holden, Miss G. Hughes, Miss Hunt,
J. Huxley, W. M. Jackson, T. E. James, Lieut. W. E. James, E. Johnson, Miss
Johnson, W. H. Jones, H. M. Kershaw, Mrs. H. Klem, Miss Lambert, K. Luxford,
Rev. Prof. G. S. Lyttel, J. E. MacKenzie, C. T. Mackintosh, R. Magee, Miss M.
D. Mark, Dr. H. N. Marrett, Mrs. E. J. Marsh, T. May, Miss E. F. Moore, Mrs.
Moorhouse, T. Morrow, Miss A. Nicolson, J. W. Patterson, Miss E. B. Pitman,
E. R. Polley, H. Prentice, G. E. Pusey, F. T. Quinn, J. Rathbone, Mrs. Repard,
Miss M. D. Rice, J. D. Robertson, H. R. Roger-Smith, Miss S. Round, G. D.
Rowe, Mrs. M. Rudduck, J. T. Russell, Mrs. H. Saunders, F. Scott, Miss E. M.
Smith, G. S. Smith, Hon. Mrs. L. Soltau-Symons, B. Squire, C. Stobart, F. Streeter,
H. R. Sweet, Miss F. Tattersall, D. Thomas, E. E. Thomas, S. J. Thomas,
W. S. Towers, Miss B. Tyson, G. Underwood, H. V. Viney, G. F. S. Walters,
W. G. Walters, J. C. Watt, H. M. Weir, F. E. Weiss, S. Wright, M. E. Yonge.

Fellows resident abroad (7).—G. B. Deshmukh, R. D. Fordham, W. Handley,
A. E. Jenkins, P. V. Kerr, Capt. P. Sarda, F. G. Storrs.

Associates (7).—Miss E. M. Barton, Miss E. Eagle-Bott, Miss E. C. Nicolls,
Miss M. Partridge, E. H. Pearce, C. Twiner, Miss W. Warburg.

Societies affiliated (11).—Accrington and District Horticultural Society,
Brighton Equitable Land Workers' Association, Codicote Horticultural Im-
provement Society, Cowling Horticultural Food Producing Association, Darnall
Horticultural and Floral Society, Disley Allotment Holders' Amateur Gardeners'
Association, Gwennap Co-operative Gardeners' Society, Lewisham and District
Horticultural Society, Longridge Horticultural Society, Porth and District
Amateur Allotment Association, Wadsley Allotment Society.

GENERAL MEETING.

JANUARY 28, 1919.

Capt. A. W. HILL, M.A., in the Chair.

Fellows elected (23).—J. D. Bailie, H. Baker, Miss E. Beck, Mrs. G. Beetham,
G. H. Boulter, Mrs. E. G. Brown, Miss A. Burton, Miss H. Chamberlain, F.
Clarke, E. C. Colchester, Mrs. A. B. Cooper, Mrs. M. A. Cradock, Miss M. Cuning-
ham, F. V. Darbishire, W. H. Davies, R. M. Dillwyn, Col. F. Dugdale, Miss
Edmiston, Miss E. Farquharson, W. Freire-Marreco, R. Fyfe, P. W. Greenaway,

ii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

D. G. Gunnell, L. T. Hale, G. G. Hardaker, B. Harland, A. W. Hawkes, B. Hedger, T. W. Herbert, C. S. Hunting, Miss B. Johnson, Miss P. Jones, F. P. Lane, Mrs. H. Longhurst, E. M. Mackay, M. McNaughton, T. P. Martin, H. J. Naish, R. S. Patterson, Mrs. G. Percy, H. Price, W. T. Raine, E. Robyns-Owen, C. P. Russell, E. H. Sams, Mrs. F. M. Saunders, H. F. Smith, G. W. Stacey, Mrs. A. E. Steeves, E. Stephenson, Mrs. A. B. Thicknesse, A. A. Tindall, Miss Trevor, J. H. Turner, K. G. R. Vaizey, J. D. Watson, Mrs. R. Wingfield.

Fellows resident abroad (1).—H. A. Gordon.

Associates (4).—Miss H. C. Fry, Miss K. Hatch, H. J. Mustchin, Miss M. Watts.

Societies affiliated (2).—Castor and Ailsworth Allotment Society, Brompton Allotment Association.

A lecture on "Pritzel's 'Index'" was given by Dr. B. D. Jackson (see p. 14).

ANNUAL GENERAL MEETING.

FEBRUARY 11, 1919.

Lt.-Col. Sir ALBERT K. ROLLIT, K.B., LL.D., V.M.H., in the Chair.

Fellows elected (70).—Lady Agnew, Miss M. B. Amos, Miss R. Attenborough, Mrs. W. Baird, L. F. Barton, A. W. Bickerton, R. Bleakley, G. H. Blount, R. Bowler, A. J. Brice, C. R. Brittain, V. E. Broad, K. St. G. Cartwright, H. R. Collins, S. G. Cuthbert, C. Dalby, R. Davies, Mrs. H. Drewitt, F. W. Durrant, A. H. Dykes, J. E. Elliott, E. S. Enock, R. Fisher, B. T. Fletcher, H. W. Francis, Mrs. E. H. Graham, F. H. Hancock, E. C. Harvey, C. W. Harris, Mrs. M. Hayes-Sadler, Miss H. Heale, Mrs. C. O. Henriques, F. A. Heron, K. Hicks, G. R. Hill, H. J. Hindson, Lady Hughes-Hunter, Mrs. E. F. Jackson, E. Jones, R. Johnston, Miss B. Josephy, A. J. Kidd, Mrs. E. Knapp-Fisher, R. A. Knight, A. H. Laurence, C. G. Lockwood, F. A. Lowell, Mrs. J. I. Lowles, J. Manrique, Mrs. F. M. Moy, Jesse Pye, Mrs. A. M. Robertson, J. N. R. Rodger, Miss M. E. Roper, Lady Sebright, G. H. Short, L. E. Smith, J. W. Spackman, Mrs. A. C. Stephens, Mrs. Sturges, Mrs. G. H. Thomas, Mrs. D. C. Trier, T. Trollope, H. Wakeford, T. Walsh, H. C. Wilcox, J. B. W. Wilkinson, Miss M. T. Willis, D. Wilson, G. Wilson.

Fellows resident abroad (1).—Bashir Ahmad, India.

Associates (9).—E. O. Barton, J. Coleman, Miss M. Jones, Miss M. Major, Miss M. Marston, Miss M. A. Regensburg, Miss P. M. Ruck, M. Takagi, Miss M. Youatt.

Societies affiliated (12).—Adlington Horticultural Society, Bradford and District Federation Allotment Association, Castleton and District Young Men's Friendly Society, Cheriton and District Gardeners' Society, Creigiau and District Horticultural Society, East Grinstead Allotment Association, Liddington Food Production Society, Lyne Club Flower, Fruit and Vegetable Society, Needham Market Horticultural Society, Newbury and District Gardeners' Mutual Improvement Society, Potters Bar and Northam Cottage Horticultural Society, Redmarley and District Horticultural Society.

The CHAIRMAN, Lt.-Col. Sir Albert K. Rollit, after putting the proposals of new Fellows to the vote, said that the number was satisfactory, but, having regard to the great work the Society was doing, much of it of the very highest national importance, especially in matters of reconstruction and trade essential to horticultural development and progress, the recruitment of the Society's membership had become a matter of the most vital and urgent necessity; and the Council trusted that every Fellow would lend them the most active assistance by proposing as many Fellows as possible, and that without delay. In this the Council claimed, and relied upon, the efforts of every Fellow and the collective effort of the whole body of Fellows. Would they not pledge themselves, and urge those absent, to join this Membership-Campaign on behalf of their great Society?

Sir Albert proceeded: The Report is one of the best, if not the best, it has ever been in the power of the Council to present, of which I have the assurance of our most able Secretary, the Rev. Mr. Wilks, who is never guilty of even a clerical error. (Laughter.) It has been said that Religion must be divine for it has even survived the Theologians, and I may add that Mr. Wilks has divinely survived all his hard work for the Society during so many years of the hardest and best service. He is our St. George—and I had nearly added: when critical, our (snap)-Dragon. (Laughter.) The Report records enthusiastic, per-

sistent, and patient effort, and marks, both by facts and figures, the great progress of the Society in all its many departments, and especially in relation to its War Service, which has been strenuous and continuous in daily work, in Publications, in Literature, in Lectures, and in the provision of Funds and Plants and Seeds for Allotments and other patriotic purposes.

The Society's War Relief Fund has, indeed, made very great progress during the year, thanks to its zealous Executive Committee, representative of the whole Kingdom, as I know from being a member of it, who has seen the good work of its President, Lady Northcote, C.S.I., its Chairman, Sir Harry Veitch, V.M.H., and the many Ladies and Gentlemen who have given their services, and its Secretaries, Mr. Howe and Mr. Henschell, C.C.; and I can also realize the value and present need of our campaign, in which about £30,000 has already been collected, in order to aid in the restoration of the ravaged lands of our Allies: France, Belgium, Italy, Roumania, and Serbia; while my personal knowledge as a traveller in all those devastated countries, and of their industrious peasantries, enables me to testify to the vast help which has been and will thus be rendered to their peoples by the free gift of the best and most carefully selected Trees, Plants, and Seeds and the means and knowledge for restoring cultivation and re-forestation.

Again, the seeds and bulbs sent by the Society to our own fellow-countrymen, prisoners in Germany, and to camps and hospitals in France and along the Mediterranean sea-board, have also given very great help, hope, and happiness to the brave but distressed sufferers. What our gifts to the British prisoners in Germany have meant in food, in joy, in hope, in sympathy, and in consolation stands out in the photographs we have recently received from Ruhleben and other prisons of our own poor captives!

The Rev. George Henslow, M.A., F.R.S., V.M.H., the Society's Professor of Botany, who has for many years been associated with the Society, and to whose Lectures we are all so greatly indebted for instruction in the marvels of plant-life-and-growth, has, to our great regret, recently retired, and the Fellows will be glad to know that Dr. Rendle, F.R.S., V.M.H., of the Natural History Museum, South Kensington, has been appointed to the Society's Botanical Professorship. (Applause.)

With Peace, there is every promise that the Society's National Diploma Examinations will now fulfil their full educational purpose. The War years have resulted in some reduction in the number of candidates; but there is every indication of a great revival of this most important National Examination, conducted by the Society.

The Society's Examinations have, indeed, become of increasing importance and are more and more widely resorted to in both the individual and national interests; and the recent setting up of a Board of Examiners, possessing both scientific and practical knowledge and experience, will go far to win the confidence of candidates and of Educational and Municipal Authorities, for whom I can thus speak as having been Mayor of Hull and Chairman of its Botanic Gardens, and for long President of the Municipal Corporations' Association of the Kingdom. Particular attention has been given to the Teachers' Examinations, for instruction in Horticulture in Schools is becoming so important that, in response to Educational requests, an Honours Examination for Teachers has also been set up; while actual practical, no less than scientific and theoretic, knowledge and work is now taking an essential part in the Teachers' Examinations.

Such really high educational work by the Society enabled me to induce my colleagues on the Senate of the University of London to raise Horticultural Studies and Research to University rank, by instituting Science Degrees in Horticulture (B.Sc. Hort., M.Sc. Hort., D.Sc. Hort.), for which there are already several candidates; and the Horticultural Education Committee of the Senate, of which I am Chairman, has also presented a Report, urging the University to increase the scope and utility of its Horticultural Teaching and Examinations through its University-Extension System, in both Rural and Urban Districts, and by Lectures and Teaching throughout the Kingdom, all which have been made possible by the pioneer educational work of our Society. The Society's series of Horticultural Charts, illustrating processes and pests in garden-cultivation, have proved a difficult item of new work; but, from the specimen Charts you see here, hanging on these walls, you will appreciate the class of work which is being done, and I think they sufficiently indicate their value; and, when the series is complete, a very good and necessary work will have been accomplished, and one which cannot fail to advance educational development and progress.

Our Lindley Library Committee keep clearly before their minds the duty committed to them by the Council when our new Library Trust was formed a few years ago; and no opportunity has been lost of acquiring valuable books—books which are not luxuries to be taxed but necessities to be read; which

are Living Universities of the dead, legacies of the great dead of all ages to the living, and friends which never alter or forsake. The revision of "Pritzel" is one of the most exacting works the Society has ever undertaken, and it will certainly be one of the most enduring services to Science which it has ever been our privilege to render. The Librarian is present in this room, with the old edition, in order to show it to anyone, and he will be pleased to explain its scope, the method of reference to its plates, and the like. A great debt of gratitude is due to SIR DAVID PRAIN, Captain HILL, of our Council, and their staff at Kew Gardens for the assistance they are so ungrudgingly rendering, as also to Dr. DAYDON JACKSON, Dr. RENDLE, Mr. BOWLES, and other members of the Committee. The Fellows are urged to take seriously this task, which the Society has set itself on scientific and public grounds, and to give it such financial assistance as lies in their power; for, if the new issue is to be sold at a sufficiently low price to place it within reasonable reach of the many, a large sum must be forthcoming in donations to reduce the cost of the publication. As a result of the Council's letter of appeal, about £500 has already been received, including £100 from Lady Dilke, who has sent a cheque in order that the memory of her late husband, a personal and parliamentary friend of mine, may thus be perpetuated and associated with this important work of Botanical and Horticultural reference.

The work at Wisley, in the beautiful Surrey Highlands and Pinewoods, the County of Commons, the Shire of open spaces, continues to hold the attention and confidence of the Horticultural community. The careful and observant Cultivation, Research and Scientific work going on there in our Gardens and Laboratory, and the valuable Trials which are being made, have attracted much attention, *e.g.* this last year the trials of Climbing Beans caused even some sensation in the Horticultural world. Now that the War is over, the area of our Wisley Gardens is being enlarged, and the Staff is being strengthened by the appointment of qualified scientific and practical teachers and assistants in our Wisley School of Horticulture—which ought to have become a College of the University of London—as rapidly as financial means will permit. Dr. Darbishire is already working on analyses to determine the food and dietetic values of the different varieties of vegetables.

A new departure in the work of the Society, and one which indicates the confidence which it has won in the Provinces, is the establishment, under our Society's direction, of Trial Experimental Demonstration Plots in Birmingham and Manchester by their Municipal Corporations. There is no doubt that these Plots will become of great educational assistance to the thousands of people who are now devoting their leisure to growing vegetables on Allotments and small Holdings, and to *petite culture*, occupations which conduce to the health, and so to the strength, wealth, and welfare of the people, and which can never be *infra dig.* (Laughter.) The old Greek Fabulist told of men digging to find gold, but who found their reward not in gold but in golden crops, worth more than gold to foodless peoples, a fable which has found its application amid the wars of our own time. For the Report also records the important work done in helping to bring about increased home-production of fruit and vegetables, the value and influences of which can hardly be fully estimated. More than ever we realize that the ruthless spoiler, be he William the Conqueror, or William the Hohenzollern, in his boast that where his war horse plants his hoof the grass never grows green again, is the Enemy, and he who makes two blades of grass grow where only one grew before is the Saviour, of mankind. (Applause.)

Moreover, it must be very gratifying to the Fellows to know that the practical powers and position of their Society are such that it was at once called upon by the Food Production Department of the Government to assist the Ministry in the work which it took up in 1916, and from that time onward a very close and organized co-operation has existed between our Society and that Department of the Government. The Report also outlines the various ramifications of our Food-Production work, and I particularize the enormous amount of labour done by the Society's Panel of Expert Gardeners and by the Lectures and instruction given by them throughout the country.

With regard to the future of Allotments and the attitude of the Society towards their patriotic cultivators, I may say that anything the Society can do in the future it will do, to help this excellent movement to continue and prosper; and I venture to express a hope that the new Parliament may be able to provide that in future every man who is willing to cultivate an allotment garden may well be helped to do so to the best advantage. A King of France uttered the pious prayer that every Frenchman should always have a fowl in his pot. This aspiration was not realized, but a cottager's own well-directed labour may ensure both wholesome food and a healthful diet.

Our "Book of Arrangements" will have raised hopes that the Chelsea Exhibition Meeting, a very popular "Annual" of the Society, will be arranged, and I have now the great pleasure to tell you that this will take place on May 20, 21, and 22.

It has been thought best not to attempt the Summer Meeting at Holland House this year. There are certain Military difficulties still in the way; and, moreover, it would follow too quickly on a Floral Fête which is to be held at Chelsea on June 24, 25, and 26 by the Committee of our War Relief Fund, to which it is hoped that Fellows will give their most cordial support by their own presence and that of all their friends.

When the Society's Hall will be released by the War Office from Military occupation and again made available for our own use is still uncertain; but it may be confidently hoped that this will be so in ample time for the Society's Meetings in 1920, and that the Society's patriotic self-sacrifice, throughout the War, will have then achieved its purpose—help to Victory and Peace.

Fellows will be interested in a correspondence which has passed between our Secretary and Professor FAIRCHILD, of the United States Department of Agriculture, in which the latter complimentarily refers to the far-reaching and most valuable influence of your Society.

It will be remembered that at the last Annual Meeting a resolution was carried by the Fellows that an effort should be made by the Council to obtain from the Food-Controller for Home Growers of Fruit sufficient sugar for the preserving of their crops. This resolution I strongly supported on the strictly economic ground that the result would benefit not only such private growers, but the whole community, by encouraging land cultivation and food production, and by withdrawing such growers from competitive purchasing of jams in the open market, thereby leaving more fruit—which is not only a food but a most necessary and wholesome diet—for general buyers. The Council at once appointed a Deputation, which I had the honour to introduce to Lord BLEDISLOE, the Chairman of the Sugar-Control Department, who, convinced by the arguments addressed to him, made the provision asked of him, and thus preserved the crops, especially the exceptionally large one of Blackberries, and so enriched many a household, and established a precedent which we quite hope to induce His Lordship to follow again this season, in the national interest no less than in that of our Fellows, for whom we shall again attend and argue by a similar Deputation. Then, may we again be able to say: "Jam satis!"* (Laughter.)

I now welcome the presence among us to-day of a very representative French Horticulturist in M. Truffaut, of Versailles, whom we shall be glad to hear, and I assure through him, as myself an Officer of the Legion of Honour of France and an active advocate of L'Entente Cordiale, as well as for many years a French Citizen, and a Juror at the Floral and Fruit Exhibitions in Paris, at the Cour La Reine, our most cordial sentiments of friendship with France and with Frenchmen. (Loud applause.)

Finally, it is my very pleasant privilege to award two of the Society's Medals. There is, happily, only one vacancy in our Roll of the Victoria Medal of Honour (V.M.H.) this year, and that Gold Medal has been bestowed by the Council upon Sir FRANK CRISP, Bt., whom all our V.M.H.s and myself will welcome as a colleague and as a notable collector of Alpine and Rock plants in his Henley garden.

The Lawrence Medal has been awarded to Messrs. SUTTON & SONS for the excellent quality and great educational value of their wonderful exhibits of summer sown vegetables. If ever a Medal was well deserved it is this one, for Messrs. Sutton are not merely constant exhibitors at our Meetings, but their exhibits are always of the very first quality.

Now, I have to move formally from the Chair, on behalf of the Council of the Society, the adoption of our Annual Report and Accounts, and, in doing so, it is both my desire and my duty to pay the highest tribute to that most "Admirable Crichton," our Secretary, the Rev. Mr. Wilks, and his assistant, Mr. Gaskell, and also to Mr. Chittenden, Mr. Wright, Mr. Reader, and our Staffs both in London and at Wisley, who are too numerous to name individually, but who have not only surmounted immense and innumerable difficulties during the War, but have also made possible and prosperous the great services of the Society for its Fellows and for the Nation, for no work has been of greater national importance and utility. (Applause.)

The adoption of the Report was seconded by Sir John Llewelyn, Bart., who remarked upon its excellence and the vast amount of work it represented

* The Deputation has since attended, and even a more liberal allowance of sugar has been made for the coming fruit season.

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as having been accomplished by the Society. The Report was then carried amid applause.

Monsieur TRUFFAUT, of Versailles, of the French Agricultural Commission, spoke on the work done in the planting of vegetables in the Army camps behind the lines in Northern France, and reported that several thousand fruit trees, which had been planted early in 1918, had been uprooted and carried to Germany after the German advance in the spring of last year.

In the absence of the Treasurer through illness the Auditor explained the position of the Society's finances.

On the proposal of Mr. C. G. A. Nix, seconded by Captain A. W. Hill, the accounts were adopted.

The following names of President, Vice-Presidents, Members of the Council, and Officers, having been duly proposed and seconded, and the list circulated in accordance with Bye-law 74, and no other names having been proposed, they were declared by the Chairman as elected:

<i>As President.</i>	<i>Proposed by</i>	<i>Seconded by</i>
Field-Marshal the Right Hon. Lord Grenfell, G.C.B., G.C.M.G.	The Rt. Hon. Lord Balfour of Burleigh, K.T., G.C.M.G.	Mr. Henry B. May, V.M.H.

<i>As Treasurer.</i>		
Sir Harry J. Veitch, V.M.H.	Lt.-Col. Sir Albert K. Rollit, D.C.L., LL.D., Litt.D., V.M.H.	Mr. F. J. Hanbury, F.L.S.

<i>As Secretary.</i>		
The Rev. W. Wilks, M.A., V.M.H.	The Rt. Hon. Lord Balfour of Burleigh, K.T., G.C.M.G.	Mr. Henry B. May, V.M.H.

<i>As Members of Council.</i>		
Lieut.-Col. F. R. S. Balfour, M.A.	Mr. F. J. Hanbury, F.L.S.	Lt.-Col. Sir Albert K. Rollit, D.C.L., LL.D., Litt.D., V.M.H.
Field-Marshal the Right Hon. Lord Grenfell, G.C.B., G.C.M.G.	Capt. Arthur W. Hill, M.A.	Mr. Arthur W. Sutton, V.M.H.
The Right Hon. Lord Lambourne, C.V.O.	Mr. Arthur W. Sutton, V.M.H.	Capt. Arthur W. Hill, M.A.

<i>As Vice-Presidents.</i>		
The Duke of Bedford, K.G., F.R.S.		
The Right Hon. The Earl of Ducie, F.R.S.		
Sir John T. Dillwyn-Llewelyn, Bart., D.L., J.P., V.M.H.		
The Duke of Portland, K.G., P.C., G.C.V.O.	Mr. E. A. Bowles, M.A., V.M.H.	Mr. James Hudson, V.M.H.
The Right Hon. James W. Lowther, P.C.		
Sir Daniel Morris, K.C.M.G., V.M.H.		
Sir David Prain, C.M.G., F.R.S., V.M.H.		

<i>As Auditor.</i>		
Mr. Alfred C. Harper.	Mr. J. Hudson, V.M.H.	Mr. E. A. Bowles, M.A., V.M.H.

Mr. W. A. BILNEY, J.P., proposed the following amendments to the Bye-laws, which were seconded by Mr. E. A. Bowles and carried:

Resolution I.

"That the following Declaration be inserted in the Bye-laws immediately following the words 'Chapter I.' and before the word 'General.'"

(CHAPTER I.)

PRELIMINARY DECLARATION.

The Society is essentially an Educational Society in both the Practice and Science of Horticulture. For this purpose it holds frequent Meetings with the

object of gathering together specimens of plants, fruits, flowers and vegetables, etc., illustrative of the continual advance being made in Horticulture by the application of science and scientific methods to their cultivation and breeding.

Lectures are delivered at these Meetings which have generally a bearing on the illustrative specimens; the one sole object of the Meetings, the illustrative specimens, and the Lectures, being the information and instruction of all who care to attend.

(GENERAL.)

Resolution II.

"That in Bye-law 11 the words 'General Meetings and Exhibitions' be amended to read 'General and other Meetings,' and that in all Bye-laws where the words 'Exhibition,' 'Exhibitions,' 'Show' or 'Shows' occur, the words 'Meeting' or 'Meetings' be substituted. See, for example, Bye-laws 3, 22, 51, 80, and any other places where either of the words may be found."

Resolution III.

"That in order to make Bye-law 96 harmonize with Bye-law 73 the words 'twenty-one days' in Bye-law 96 be altered to read as in Bye-law 73 'fourteen days.'"

The Meeting closed with a vote of thanks to the Chairman, moved by Mr. Arthur W. Sutton, J.P., V.M.H., seconded by Mr. Bilney, J.P., and carried by acclamation, which Sir Albert Rollit, the Chairman, acknowledged.

REPORT OF THE COUNCIL FOR THE YEAR 1918.

1. **The Year 1918.**—In issuing the one hundred and fifteenth Report of the Society, the President and Council feel that they have very great cause to congratulate the Fellows, not only on the conclusion of the most terrible war which this country (or indeed any other country) has ever had the misfortune to have been forced to engage in, but also on the fact that, notwithstanding the financial strain which has fallen upon all classes of the community, the Society itself has been able to weather the storm, and even in this last year to restore, to some slight extent, its numbers, which the first year of the War had so greatly depleted.

Through the Food Production Department, the Government have made great use of the Society's experience and organization, and the President and Council have been only too glad to place themselves and their officers at the Government's disposal. This has added vastly to the work of the office, but the whole of the staff have wrought with a will to make themselves thoroughly useful in the hour of their country's necessity, and the President and Council have the satisfaction of knowing that the prestige of the Society never stood higher than it does at the present moment in every part of the Empire.

2. **R.H.S. Food Production Campaign.**—It will be remembered that the Director-General of Food Production enlisted the Society's organization and technical staff for the work of his Department when it was first set up early in 1917. Dr. F. Keeble, F.R.S., C.B.E., the Director of the Society's Gardens at Wisley, was released to take the post of Director of the Horticultural Section, and subsequently Controller of Horticulture, in the Food Production Department; whilst Mr. F. J. Chittenden, V.M.H., the Head of the Laboratory and Technical Instruction at the Gardens, Mr. S. T. Wright, the Superintendent, and other members of the Wisley Staff, have also rendered most useful services of a special nature. This work has been steadily continued during the past year with the object of increasing the fruit and vegetable production of the country.

3. **R.H.S. Panel.**—The Society's Panel of Expert Garden Advisers, which now contains 2,000 names enrolled upon it, has also rendered inestimable services, the full extent of which can never be actually determined. Their periodical reports clearly indicate the influence they have exercised by the lectures, demonstrations, and instructions they have given to those who have been growing their own vegetables during the years of the War.

4. **Special Lecturers.**—Similarly the work done by the Society's Special County Representatives and Lecturers (32 in number) cannot fail to be productive of good and enduring results. After attending a ten days' Conference at the Society's Gardens at Wisley, these Lecturers were sent forth all over the country. The object of the Conference was to discuss the best methods of growing food-stuffs in gardens and allotments, and the Lecturers were thus brought to a uniform line of instruction, so that all might be teaching the same general principles and practice of cultivation. A Report made by the Society to the Director-General of Food Production on the work of the twelve months ending March 1918, showed that over 400 lectures had been delivered by them during the winter of 1917-18, and that no fewer than 39,000 people, mostly cottagers and allotment holders, had attended them.

Both this and the Panel work has involved a very large amount of labour and thrown considerable strain upon the organizing staff at Vincent Square. The work of the Special Lecturers is being continued on still wider lines during this passing winter, but the complete figures will not be available till the end of March.

The figures given in the preceding paragraphs do not include the lectures given by Mr. Chittenden, V.M.H., the Head of the Wisley Educational Department, who has been in great demand all over the country for lectures of a specially high order. His work in this direction has been very influential and has gone far to establish the pre-eminence of the Society's teaching staff. Amongst the centres at which his Courses of Lectures have been delivered

are: Nottingham University College, Birmingham University, The University of London, Gresham College, Bishopsgate Institute, Sheffield, Manchester, Norwich, etc.

A popular lecture on "Potato Growing (Spring Work)," promoted by the Society and delivered at the Mansion House on February 13, by Mr. W. Cuthbertson, J.P., V.M.H., was an unqualified success. The Right Hon. the Lord Mayor was in the chair, and the Egyptian Hall was crowded from end to end by an attentive audience. A companion lecture was given by Mr. Cuthbertson on "Summer and Autumn Work in Potato Growing," at the Caxton Hall, Westminster, on June 19, when the Rt. Hon. Lord Bledisloe (Sir Charles Bathurst) was in the chair.

To all these gentlemen—to Mr. Cuthbertson, to Mr. Chittenden, to the Special County Lecturers, and to the Members of the Society's Panel of Advisers, the President and Council desire to accord their heartiest thanks for the good work they have done and for the able manner in which they have one and all helped to maintain the Society's prestige.

The Society's printed lectures with lantern slide illustrations, have also been most useful. They were first circulated in the autumn of 1917, and consisted of a series of 21 printed lectures and more than 100 sets of illustrative lantern slides. During the winter of 1917-18 they were utilised by no fewer than 639 Societies, and were the means of instructing upwards of 50,000 people.

Four Members of the Council, Lord Lambourne, Messrs. W. A. Bilney, A. W. Sutton, and James Hudson, have for the last three years inspected the gardens of the London Children's Garden Association, and have been greatly pleased at the evidence of diligent cultivation which the gardens displayed in most of the localities they visited.

5. R.H.S. Travelling Exhibit.—As the Society's Food Production work grew and developed, a need was felt for models, specimens, charts, etc. These were required for the many Food Production Exhibitions which have been held all over the country by Educational Authorities, Public Schools, Horticultural and Allotment Societies, Horticultural Instructors, Lecturers, and others. The work of preparing models was accordingly taken in hand, with the result that early in the year a highly instructive exhibit was available. It was first shown at the Exhibition of the Institute of Hygiene in Devonshire Street, London, and has subsequently travelled to many parts of the country in charge of the Society's Representatives, Mr. C. H. Curtis, Mr. W. H. Divers, V.M.H., Mr. W. Stewart, N. D. Hort., and Mr. C. R. Fielder. Twenty-six exhibitions, lasting from a week to a fortnight, have thus been visited, and many thousands of people have benefited thereby. The exhibit includes models of various garden operations, such as the right way of digging and trenching, the planting of potatoes, the making of a potato clamp, the testing of seeds for germination, specimens of diseases, and sixty museum cases of insects (both helpful and harmful) met with in the garden. This collection of specimens is one of the best in the country, and it has proved highly attractive. The exhibit was inspected on October 26 by the Queen at the Caxton Hall, Westminster, when Her Majesty was graciously pleased to express her appreciation of the work the Society is doing, and to wish it every success in its efforts for furthering the increased production of orchards, gardens, and allotments throughout the country.

The Society has spent over £2,500 during the year on its Food Production work, for which a grant is being given by the Treasury through the Food Production Department.

6. The Future of Allotments.—The preceding paragraphs will have shown to the Fellows what a vast amount of work the Society has done in these various directions to encourage and assist the Allotment Movement, which, during the War, has spread so happily from one end of the country to the other. The President and Council have rejoiced to see it taken up with such enthusiasm, and to hear from their County Representatives, Lecturers, and Panel, how excellent the cultivation of these allotment gardens has generally been, and what an enormous amount of vegetable food they have produced.

It remains only to say—(1) that anything the Society can do in the future, with the very limited means at its disposal, it will do, to help this excellent movement to continue and prosper; and (2) to express a hope that the new Parliament may be able to provide that in future every man who is willing

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to cultivate an allotment garden well, shall be enabled to do so. Whether the actual present allotments can in all cases be continued depends on many different considerations, but the Council are unanimous in expressing their opinion that so far as accessible land can be found, an allotment garden ought to be available for every man in this country who, having no garden attached to his dwelling, desires one; and that the provision of them ought to be made out of National Funds, and with fairness and even with generosity towards the present land-owners. The President and Council are convinced that such provision of National Allotment Gardens to all who desire them and work them well will be of inestimable value to the country at large in promoting the health, and happiness, and well-being of the community in general.

7. **Publications.**—The Society's War Publications, Pamphlets, and Leaflets have continued to be in demand. After the very heavy issue of 1917 and the first four months of 1918, it was no little relief to the office staff to know that their immediate purpose had, in the main, been accomplished, and some little falling off from the previous demand for them gave welcome relief from the heavy strain which the Publications Department had borne during the previous months.

8. **The Society's Influence.**—It is often felt that Fellows are insufficiently acquainted with the far-reaching influence of the Society. Its correspondence has, certainly for the last thirty years, been world-wide, and its *Journal* and other publications are read even in the remotest parts of the earth wherever a Botanic station or a garden of any pretension exists. In this connexion Fellows will be gratified to know that the influence of the work they have been doing through the Society for the War has not been confined to Great Britain only. Its influence has reached forth across the Atlantic to the Senate of the United States, where letters from the Society, written in 1917, were read to the Members present and called forth the following replies from Dr. David Fairchild, to whom the communications were addressed:—

“United States Department of Agriculture,

“Washington, D.C., *February* 19, 1918.

“DEAR MR. WILKS,—Your letter of January 11 came in the nick of time, as we say in this country.

“A Bill was being introduced in Congress for the erection of Community and Experimental Drying-plants, and I took the liberty of reading to the Senate that portion of your letter dealing with the subject of public store-houses, and the canning and drying of vegetables. The citations from your letter added weight to the arguments which I presented.

“Very sincerely yours,

“DAVID FAIRCHILD,

“Agricultural Explorer in Charge.”

“Washington, D.C., *July* 6, 1918.

“MY DEAR MR. WILKS,—I have been so rushed with other matters that I have not shown you the courtesy of acknowledging the receipt of your very remarkable letter with regard to the situation as you see it from your point of advantage as Secretary of the Royal Horticultural Society. I have taken the liberty of using extracts from your letter in an appeal which we are sending to all those who receive regularly our bulletin. . . . Copies of this have gone out to about 250,000 people, and we are now running a second edition. It will also be published in the *National Geographic Magazine*, which has a circulation of 600,000, and extracts from it have appeared in many of the largest magazines of this country. I presume that before the season is in full swing five or six million people will have had a chance to read it.

“If you, after reading the bulletin, have any suggestions to make, they will be most keenly appreciated by us.

“Very sincerely yours,

“DAVID FAIRCHILD,

“Agricultural Explorer in Charge.”

Letters of grateful appreciation from Fellows and others for the work of the Society, and the influence it exercises, are received almost daily; but when the Society is found to have influenced so important a body as the Senate of the United States, and on such an important topic, it justifies special attention and permanent record. As our American cousins have so ably assisted in

bringing the War to an end, it is good to feel that the Royal Horticultural Society of Great Britain has helped them, if only in so small a degree as this.

9. **The Lindley Library.**—The Library has been maintained in a state of efficiency, and though the number of Horticultural books put on the market during the War has not been so great as before, no opportunity has been lost of acquiring any valuable books which have been offered.

10. **Seeds for Hospitals.**—Seeds and bulbs were again sent to our fellow-countrymen prisoners in Germany, and to camps and hospitals in France and in the Mediterranean regions.

11. **Wisley Gardens.**—The work at Wisley, as in all other gardens, has been greatly handicapped by shortage of labour and the absence on special Government war-work of almost the whole of the Laboratory Staff. The difficulty has been met to some extent by the elimination of all trials of flowers for the period of the War, and by postponing all new developments in the Garden.

The vegetable trials, which are such an important feature of the Society's work, have been continued, and a number of trials of plants of possible garden value have also been made, some of them at the request of the Food Production Department of the Government. Special interest was taken in the trial of climbing beans, which has revealed the existence of several of probable value for English gardens both for use as green pods and of winter value for their dry seeds. A full report of these has appeared in the *Journal*.

Of cultural experiments made in the Garden during the past year special mention may be made of planting to ascertain the most economical method of spacing parsnips and potatoes. Tests of the value of "sludge" manures, and of organic manures as compared with chemical fertilizers, have also been made. These will be reported upon in the *Journal*. The experiments on the pruning of fruit trees are being continued, whilst many of the new crosses of vines, strawberries, and Rubi raised in the Gardens should fruit next season and show their value.

Mr. Ramsbottom, who has now taken up a new position, was able to carry out another season's work upon the eelworm disease of Narcissi, a report of which will be published in the Society's *Journal*. Mr. Ramsbottom has consented to continue this investigation till its completion.

Dr. F. V. Darbishire, M.A., has been appointed to carry out researches into the comparative composition of different varieties of the same vegetable, in order to ascertain whether one variety is of greater food value than another, as appears probable. He took up his duties in August. Mr. Ramsbottom's place has been filled by Mr. A. T. Rudge, an old student at Wisley.

The School of Horticulture has been continued throughout the War although the number of students has been small. The cessation of hostilities will probably make considerable demands upon our accommodation in this direction.

A very large number of visitors have been to the Garden during the past year, mostly seeking advice upon Food Production. The exceptional crop of apples of excellent quality in the Garden this year, due chiefly to timely spraying in the spring, has given the opportunity of arranging a comprehensive collection of varieties in the Laboratory for the information of visitors.

12. **Birmingham and Manchester Trial Plots.**—The Food Production work of the Society has undoubtedly brought it into wider relationship with the country at large. This has recently been made manifest in many ways. One of these was a request by the Birmingham Corporation for the Society to take up the direction and supervision of a series of demonstration plots for which it was prepared to provide the ground and the labour if the Society would provide the seeds of the plants to be grown, and generally direct their sowing and cultivation on similar lines to those adopted by the Society in its own Gardens. The object of the Corporation in providing these demonstration plots is that their allotment holders may work more intelligently and be better informed as to the varieties which are most likely to bring about the best results in their neighbourhood. The Council viewed the proposal favourably, and plots have now been set up and the work is in progress. The Manchester Corporation are now taking similar steps, and have asked the Society to identify itself with them on similar lines.

13. R.H.S. Gardening Charts.—The growing demand from all parts of the country for instruction in gardening, and the emphasis which the new Education Act will give to the subject, throws upon the Society the responsibility for providing such authoritative material as will assist teachers and instructors in their work. One step the President and Council have already taken is to provide a series of Wall Charts illustrating garden subjects, such as insect pests, fungus pests, garden operations, fruit-growing operations, etc. These charts are now well in hand, and some have already been issued. A full list of those in preparation and of those now available can be obtained from the Secretary at the Offices, Vincent Square.

14. Examinations.—With the view of further encouraging and extending the general range of horticultural knowledge throughout the country, not only amongst working and professional gardeners, but also amongst horticultural instructors and teachers of all grades, the Society's Examinations have been considerably revised in the direction of making them a more practical test of horticultural knowledge and experience. A Board of Examiners has been set up (see page 43, Book of Arrangements), which first dealt with the syllabus and regulations for both the General and School Teachers' Examinations, so that not only has their standard been raised, but the practical experience and knowledge required of candidates in future will be increased. The School Teachers' Examination particularly has been revised, and now consists of both an Elementary and an Honours Examination, in both of which evidence of actual practical work will be required of all candidates. In the Honours section practical work will form an actual part of the Examination itself.

The Degrees in Horticulture of the University of London have now come into operation, inasmuch as five Candidates have entered for the Bachelor's Degree this year, a result due largely to the action of the Society and the Resolution for the conferment of such Degrees moved by Sir Albert K. Rollit, V.M.H. (a Member of Council), in the Senate of the University.

The Series of Examinations which have now been set up for workers in horticulture, ranging from the Society's Junior Examination to the Senior School Teachers', the National Diploma, and finally the University Degree in Science, represent several links in a chain which is now educationally complete.

15. Deputations &c.—The President and Council have kept careful watch on such various interests of Horticulture as have from time to time been affected by war conditions.

The last General Meeting of the Fellows passed unanimously the following resolution on the motion of Charles E. Shea, Esq., seconded by the Rev. G. H. Engleheart, M.A., V.M.H.:—

"That the Fellows of the 'Royal Horticultural Society,' in Annual Meeting assembled, record an emphatic protest against the decision of the Food Controller that, notwithstanding that there is an officially admitted greater quantity of sugar now in this country than was available last year, no sugar is this year to be allowed for home-made jam, or preserves, to the private growers of fruit, entailing the loss of an immense amount of valuable national food; and this Meeting further records its entire approval of the Memorandum of Protest addressed by the President and Council of the Society to the Director of Sugar Distribution on the 31st January last."

This question touched the interests of the great majority of our Fellows, and was at the same time consistent with the economic interests of the community in that it enabled private fruit-growers to save their fruit and so to have no (or less) need of buying jam in the open market in competition with the general public. Approving this resolution, the Council at once took steps to carry it out by obtaining an appointment which was readily given by Lord Bledisloe (then Sir Charles Bathurst), the Director of Sugar Supplies, who courteously listened to the Deputation which waited upon him, consisting of the Rt. Hon. Lord Lambourne, Sir Albert Rollit, and Messrs. W. A. Bilney, J. Cheal, James Hudson, C. E. Shea, A. W. Oke, W. H. Page, Owen Thomas, and the Rev. W. Wilks. The Deputation was introduced by Sir Albert, and several members addressed Sir Charles, who ultimately promised an allowance of sugar for preserving (and though, according to correspondence in the newspapers, some growers did not receive their full quantity, this, it is understood, was due to faulty distribution, for which the Department was not responsible); so that the result of the Deputation was successful and private

fruit-growers thus assisted were generally satisfied with the action of the Society and the response of the Department.

Representations have also been made to the Prime Minister on the subject of Afforestation; to the Minister of National Service on Man-power and its Application to Gardeners; to the Controller of Mines on the Provision of Fuel for Horticultural Purposes, which resulted in special consideration being given in the case of valuable stocks of plants; to the Rt. Hon. R. E. Prothero concerning Seed Potatoes; and to the Commission on the proposed Luxury Tax on the Exemption of Scientific and Educational Books from Taxation.

A Deputation from the Society was sent to the 50th Anniversary Exhibition of the Southampton Royal Horticultural Society on October 15. It consisted of Sir Daniel Morris, K.C.M.G., V.M.H., Mr. Arthur W. Sutton, V.M.H., Mr. James Hudson, V.M.H., and the Rev. W. Wilks, M.A., V.M.H. The Deputation was given a very cordial welcome, and awarded the Society's Medals at what was undoubtedly a most excellent exhibition, and one in every way worthy of that Society. The President and Council particularly wish to acknowledge the courtesy and hospitality afforded by Professor G. S. Lyttel and Mr. C. S. Fudge to the Members of the Deputation.

16. R.H.S. Hall.—Fellows can now look forward to reoccupying their own Hall at Vincent Square within (it is hoped) a short space of time, as the advent of Peace will liberate it from the military purpose to which it has been devoted during the last two years. How long it will actually be before the Fortnightly Meetings can again be held in the Hall it is, of course, impossible to say at the present moment; but the Council have little doubt but that the Australian Imperial Force will wish to redeem the promise given on their behalf by General Anderson when he first opened negotiations for its acquisition, namely: that it should be returned to the Society at the earliest possible moment.

17. Pritzel Revision.—Perhaps the most important permanent technical work done by the Society during the year is that which concerns the revision of "Pritzel." Fellows will be glad to learn that the work is now actually in hand. In last year's Report it was mentioned that two Committees had been set up for defining the extent of the work to be taken in hand, and this they have done, outlining the scope of the work and appointing the staff for seeing it through its first stages. Typists are now daily at work preparing the manuscript for the publishers. With the kind consent of Sir David Prain, C.M.G., F.R.S., V.M.H., Director of the Royal Botanic Gardens, Kew, they are working at Kew, under the personal supervision of Captain Arthur W. Hill, Assistant-Director, and a Member of the Society's Council. It is estimated that the new work will include about 250,000 references. A special communication on this subject is being issued to the Fellows with this Report, to which they are referred for further information concerning the purpose of this monumental work which the Society has undertaken, and which, as a scientific and practical record, will ever remain as a lasting evidence of the devotion of the Society to both the practice and the science of gardening. Fellows are invited to give generous financial assistance, as the work will cost at least £3,500 to produce. All the Botanic Stations, Experimental Stations, and the most important Libraries throughout the world are also being asked to assist. Subscribers of £15 15s. will receive a free copy; subscribers of fifty guineas will receive a copy bound in half-calf; subscribers of £100 will receive a copy bound in calf or in vellum, as they may prefer. It is proposed to publish the names of all subscribers of £1 1s. and upwards in the introduction of the new work, so that they may be known to those who come after as those to whom the new Pritzel is due.

18. Trafalgar Square Fête.—Fellows will be interested to know that the Society's Exhibition staff was lent to the British Ambulance Committee for organising and assisting at its Floral Fête held in Trafalgar Square in June. In a letter of appreciation from the Rt. Hon. Lord Beresford, G.C.B., chairman, and Mr. Bradby Peyman, the vice-chairman, acknowledging the assistance rendered by the Society, it is said that nearly £9,000 was collected. The letter goes on to say: "We fully realize that the same measure of success would not have resulted had it not been for your Council's co-operation and assistance." Special thanks are due to Mr. Bisset and Mr. Jordan in this respect.

19. War Relief Fund.—The Special Committee appointed to carry out this branch of the Society's work, as announced in last year's report, has made

satisfactory progress. Amongst other arrangements Lady Presidents have kindly undertaken to collect funds in the English Counties, whilst Miss Balfour is acting as Convener for Scotland and the Countess of Bessborough in the same capacity for Ireland, the Lady Northcote, C.I., being the Lady President of the General Committee. The Council tender their very sincere thanks to these ladies for the interest they are taking in the success of the movement. Consultations are being held with the Official Representatives in this country of France, Belgium, Serbia, and Rumania, with a view to ascertaining the most effective methods of dealing with the funds collected.

The Rt. Hon. the Lord Mayor of London (Sir Horace Brooks Marshall, LL.D.) very kindly occupied the chair on December 18 at a Meeting at the Mansion House in aid of the Fund, when Sir Harry Veitch, V.M.H., and the Speaker of the House of Commons (the Rt. Hon. J. W. Lowther, P.C., M.P.) eloquently advocated its claims, praising very highly the good object in view. A cordial vote of thanks to the Lord Mayor for his kindness was proposed by our President, Field-Marshal Lord Grenfell, G.C.B., G.C.M.G., seconded by the Lady Northcote, and carried with acclamation.

20. The Future of Scientific Workers.—It is a welcome sign of the times that gardeners are more and more seeking to advance the interest and utility of their work by accepting the help which the Science of Horticulture can afford them. Towards this point the Society has been working for many long years. It is always hard to break down the prejudice which almost everywhere exists between Practice and Science, and from which practical gardening is by no means exempt, but that this prejudice is preparing to yield is evidenced by the fact that the horticultural scientist is beginning to find a place in the Laboratories of our leading gardening firms. For this purpose the Council were glad to release Mr. J. K. Ramsbottom, one of the Society's Researchers at Wisley, for an engagement with one of our leading horticultural firms, for their scientific work. It is hoped that the day is not far distant when the Society will be in a position to provide from the Laboratory at Wisley all such scientific workers as may from time to time be required by trade firms.

21. Council.—The President and Council experienced a great disappointment in March, caused by the retirement of one of their most valued Members, Sir David Prain, C.M.G., F.R.S., V.M.H., the Director of Kew, for though he had been a Member of Council for little more than a twelvemonth his advice and co-operation had not only been of the greatest possible service to the Society, but he had also endeared himself personally to all the members of Council and Staff. He would greatly have liked to continue to act on the Council, but the increase of work falling on him officially at Kew made it imperative, from a medical point of view, that he should give up all external engagements. The Council were, however, greatly rejoiced when Captain Arthur Hill, M.A., Sir David's Assistant-Director at Kew consented to take his chief's place.

22. Journal.—The President and Council greatly regret the unavoidable delay which has attended the publication of the Society's *Journal* during the past year—delay due entirely to the threefold cause of (1) depletion of staff, (2) extreme shortage of paper, and (3) the difficulties which have attended the printing trade all over the country. It is confidently hoped that the present year may see a great improvement in all of these respects and a consequent resumption of the *Journal's* regular publication.

23. Training of Soldiers.—Negotiations with the Government are now in progress as to the possibility of the Society receiving discharged soldiers at the Wisley Gardens for training in Horticulture.

24. Obituary.—The Council have to record with deep regret the death of many Fellows, and friends of, and workers in Horticulture, amongst them the following:—The Earl of Suffolk, Lord Abinger, Lord St. Audries, Sir Ratan Tata, Sir H. Weber, the Rev. C. H. Bulmer, and Messrs. E. J. Allard, H. J. Cutbush, G. H. Davidson, J. Harrison Dick, E. Goodyear, J. Leeman, F. H. North, F. Monteith Ogilvie, R. Hooper Pearson, John Pope, T. Rochford, E. J. Stubbs (the architect of the Society's Hall), Monsieur Maurice de Vilmorin, Miss E. C. Talbot, and Miss Ethel Sargent.

25. V.M.H. and Lawrence Medal.—There being only one vacancy in the Roll of the Victoria Medal of Honour, the Council have had very great pleasure

in nominating Sir Frank Crisp, Baronet, a gentleman who has done so much for Horticulture in general and especially in his wonderful collection of Alpine and Rock Plants.

The Lawrence Medal for 1918 the Council have awarded to Messrs. Sutton & Sons for the excellent quality and great educational value of their frequent and really wonderful exhibits of summer-sown vegetables.

26. Numerical Position.—The following table shows the Society's position with regard to numerical strength during the past year :—

LOSS BY DEATH IN 1918.				FELLOWS ELECTED IN 1918.			
		£	s. d.			£	s. d.
Life Fellows	3	0	0 0	4 Guineas	7	29	8 0
4 Guineas	1	4	4 0	2 „	220	462	0 0
2 „	55	115	10 0	1 „	703	738	3 0
1 „	50	58	16 0	Associates	16	8	8 0
Associate	0	0	0 0	Affiliated Societies	195	214	4 0
				Commutations	5		
				= £101 15s. od.			
	115	£178	10 0				
LOSS BY RESIGNATION, &c.				Loss.	1146	£1,452	3 0
						540	15 0
				NET INCREASE IN INCOME			
						£911	8 0
4 Guineas	0	0	0 0	Deaths and Resignations			345
2 „	117	245	14 0	New Fellows			1,146
1 „	100	111	6 0				
Associates	6	3	3 0	NUMERICAL INCREASE			801
Affiliated Societies	1	2	2 0				
	230	£362	5 0	Total on December 31, 1917			13,831
TOTAL LOSS	345	£540	15 0	Total on December 31, 1918			14,632

27.—Committees, &c.—Even more than in any recent years are the thanks of the Society due to the members of the Standing Committees and to the Lecturers and Judges who have had to work in the darker, colder, and less convenient quarters of the Drill Hall instead of in our own premises. The Council are confident, however, that these unavoidable inconveniences have been gladly borne in order that our own building might be used for the benefit of our Australian kinsmen who have wrought so nobly in defence of the Empire all through the War.

Thanks are also due to all those who have done such good service on Special Committees, or as Examiners, Compilers of Extracts, Reviewers, and Writers of Papers for the *Journal*, contributing thereby to the Society's national usefulness, and helping to maintain its high standing among the practical and scientific institutions of the world.

The Council also wish to thank Captain Scott and the Staff of the London Scottish for the invariable courtesy and consideration the Society has received at their hands.

Last, but not least, the Council desire cordially to acknowledge their obligations to their own Staff, who have been working under exceptionally difficult conditions; and also to the Press for their invaluable assistance in reporting, and calling attention to, the work of the Society.

By Order of the Council,
W. WILKS,
Secretary.

ROYAL HORTICULTURAL SOCIETY,
VINCENT SQUARE, WESTMINSTER, S.W.
January 1, 1919.

Dr.

ANNUAL REVENUE & EXPENDITURE ACCOUNT

		£	s.	d.	£	s.	d.
To ESTABLISHMENT EXPENSES—							
Ground Rent		690	0	0			
Rates and Taxes		623	13	6			
Water Rate		24	4	4			
Electric Light		18	7	4			
Gas		31	10	7			
					1,387	15	9
Salaries and Wages	£2,259 17 2						
Bonuses	527 15 0						
					2,787	12	2
Printing and Stationery		1,548	3	11			
Publications		1,540	3	11			
Postages		580	1	4			
Fuel		19	6	10			
Professional Fees		203	3	0			
Gratuities		46	0	0			
Repairs and Renewals (including £150 for Hall Painting)		215	3	9			
Miscellaneous Expenses		173	9	4			
					7,113	4	3
„ INSURANCES					176	18	0
„ JOURNAL, PRINTING AND POSTAGE					2,232	10	6
„ STAFF PENSION		257	0	0			
Less contributed by the Staff, as per scheme		110	6	6			
					146	13	6
„ MEETINGS—							
Autumn Fruit and Vegetable Meeting		221	10	3			
Labour, Floral Meetings and Conferences		274	0	4			
Expenses, do. do.		86	18	7			
Council, Committee and Deputation Expenses		192	10	11			
Painting Orchid Certificates		30	10	6			
					805	10	7
„ INSPECTION OF GARDENS					199	6	3
„ PRIZES and MEDALS—							
Awarded at Society's Meetings					211	18	10
„ CONTRIBUTION to LINDLEY LIBRARY—							
Purchase of Books		36	3	5			
Expenses		53	0	0			
					89	3	5
„ SPECIAL EXPENDITURE—							
Contribution to Forrest Account		329	5	7			
Educational Models		68	13	10			
Paintings of British Orchids		56	10	4			
					454	9	9
„ DEPRECIATION—							
Hall Glass Roof, Furniture, and Appliances for Meetings					260	19	3
„ CONTRIBUTION TO WAR RELIEF FUND					1,000	0	0
					14,078	10	1
„ BALANCE, carried to BALANCE SHEET					8,434	19	11
					<u>£22,513</u>	<u>10</u>	<u>0</u>

FOR YEAR ENDING 31st DECEMBER, 1918.

Cr

	£	s.	d.	£	s.	d.
By ANNUAL SUBSCRIPTIONS				17,314	10	6
„ ENTRANCE FEES				244	13	0
„ DIVIDENDS AND INTEREST	2,183	7	9			
„ do. do. DAVIS TRUST	50	10	6			
				2,233	18	3
„ TAKINGS AT HALL MEETINGS				29	2	0
„ JOURNALS AND OTHER PUBLICATIONS—						
Advertisements	182	17	0			
Sale of Publications	1,992	16	8			
				2,175	13	8
„ HALL LETTINGS				7	12	6
„ PRIZES AND MEDALS				100	10	2
„ EXAMINATIONS IN HORTICULTURE—						
Received in Fees	315	7	6			
Less Amount Expended	255	2	9			
				60	4	9
„ LIFE COMPOSITIONS—						
Being amount paid by Fellows now deceased				84	0	0
„ RENT OF COTTAGES, WISLEY				62	8	0
„ INSPECTION OF GARDENS				200	17	2

£22,513 10 0

Dr.

VINCENT SQUARE—BALANCE

LIABILITIES.

To CAPITAL FUNDS ACCOUNT—			£	s.	d.	£	s.	d.
As at 31st December, 1917			46,464	3	0			
Less Fees paid by Fellows now deceased			84	0	0			
						46,380	3	0
„ LIFE COMPOSITIONS, 1918						239	8	0
„ SUNDRY CREDITORS						1,547	13	3
„ SUBSCRIPTIONS, &c., paid in advance						313	8	6
„ WISLEY SCHOLARSHIPS—								
Balance 31st December, 1917.						5	4	2
„ RESERVE ACCOUNT—HALL PAINTING—								
Balance 31st December, 1917.			973	13	4			
Added 1918			150	0	0			
						1,123	13	4
„ DEPRECIATION AND RENEWALS RESERVE								
ACCOUNT—								
Balance 31st December, 1917			3,003	10	0			
Added 1918.			260	19	3			
						3,264	10	0
„ LABORATORY PRIZE FUND—								
Balance 31st December, 1917			10	19	10			
Dividends (Nicholson Memorial Fund)			6	3	2			
						17	3	0
„ WILLIAMS MEMORIAL FUND						38	0	1
„ MASTERS MEMORIAL FUND						08	4	4
„ SCHRÖDER PENSION						6	11	8
„ LINDLEY LIBRARY TRUST						10	0	0
„ PRITZEL REVISION FUND						6	14	1
„ GENERAL REVENUE ACCOUNT			48,855	15	8			
Less Bad Debts			53	8	4			
						48,802	7	4
„ REVENUE FOR THE YEAR, as per								
annexed Account			£8,434	19	11			
„ CAPITAL FUNDS' ACCOUNT, Wisley			142	0	10			
						£8,577	0	9
Less WISLEY GARDENS, Excess								
of Expenditure over Income			4,480	3	0			
						4,090	17	9
						52,899	5	1
						£105,919	18	0

ASSETS.

		£	s.	d.	£	s.	d.
By CAPITAL EXPENDITURE—							
„ NEW HALL AND OFFICES—							
As at 31st December, 1917		41,277	13	4			
„ FURNISHING HALL AND OFFICES—							
As at 31st December, 1917		2,464	9	8			
„ FREEHOLD LAND AND COTTAGES AT WISLEY		2,415	9	5			
					46,157	12	5
„ APPLIANCES FOR MEETINGS					236	11	0
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE					2,303	11	9
„ WORKING WATER CO.—							
Deposit in respect of laying water-mains from Ripley to Wisley Gardens					1,260	0	0
„ FOOD PRODUCTION—							
Amount due from Board of Agriculture					1,701	13	9
„ STOCK ON HAND, WISLEY—Coal and Coke		250	0	0			
„ „ „ VINCENT SQUARE — Sundry Stocks		1,123	0	0			
					1,373	0	0
„ EDUCATION CHARTS, Johnson, Riddell & Co.					750	0	0
„ PRITZEL REVISION FUND —Loan Account					375	0	0
„ INVESTMENT of DEPRECIATION and RENEWAL and RESERVE ACCOUNT—							
3½ % India Stock £2,367 18 9 cost		2,211	12	10			
2½ % Consols £476 8 4		280	1	1			
5 % War Loan £500 0 0		467	11	0			
					2,959	4	11
„ INVESTMENTS, as per Schedule at cost					45,097	5	5
<i>(In common with most pre-war Securities the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before.)</i>							
„ CASH—							
At Bank		617	7	9			
On Deposit		2,000	0	0			
In Hand		88	11	6			
					2,705	19	3
					£105,919	18	6

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on the 31st Dec., 1918.

ALFRED C. HARPER, F.C.A., Auditor,
(HARPER BROTHERS & FEATHER, Chartered Accountants),
35 GREAT TOWER STREET, LONDON, E.C.

17th January, 1919.

Dr. WISLEY GARDENS—ANNUAL REVENUE & EXPENDITURE

	£	s.	d.	£	s.	d.	£	s.	d.
To SALARIES—									
Wisley Gardens and Research Station	1,655	10	2						
Do. Bonuses	357	18	10						
							2,013	9	0
„ RATES AND TAXES	114	5	8						
„ WATER RATE	45	2	0						
„ INSURANCES	59	7	5						
„ LABOUR	1,789	5	2						
„ GARDEN IMPLEMENTS	19	1	0						
„ LOAM AND MANURE	47	8	8						
„ REPAIRS	246	1	7						
„ FUEL	416	19	10						
„ MISCELLANEOUS EXPENSES—									
Garden	246	16	7						
Laboratory	102	18	3						
							349	14	10
„ CARTAGE	93	5	3						
„ TREES AND SHRUBS	9	19	6						
							3,190	10	11
„ COST OF GROWING, PACKING AND DISTRIBUTION OF									
PLANTS TO FELLOWS							169	4	3
„ STAFF PENSION	198	18	4						
Less contributed by the Staff, as per scheme	66	10	0						
							132	8	4
„ DEPRECIATION—									
Glass Houses, Plant and Materials							540	18	6
							<u>£6,046</u>	<u>11</u>	<u>0</u>

ACCOUNT FOR YEAR ENDING 31st DECEMBER, 1918.

Cr.

	£	s.	d.	£	s.	d.
By DIVIDENDS AND INTEREST				1,058	3	11
„ PRODUCE SOLD				492	9	1
„ STUDENTS' FEES				15	15	0
„ BALANCE, being excess of Expenditure over Revenue				4,480	3	0

£6,045 11 0

Dr.

WISLEY GARDENS—BALANCE

LIABILITIES.

	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—						
As at 31st December, 1917	33,074	14	4			
Less Amount transferred to R.H. Society, 31st December, 1918	142	0	10			
				32,932	13	0
„ ENDOWMENT FUND.				25,000	0	0
„ DEPRECIATION AND RENEWALS—						
As at 31st December, 1917	3,851	8	3			
Added, 1918	340	3	6			
				4,191	11	9

£62,124 5 3

ASSETS.

By DWELLING HOUSES—			£	s.	d.	£	s.	d.
As at 31st December, 1917			5,651	17	4			
„ GLASS HOUSES, RANGES, POTTING SHED, &c.—								
As at 31st December, 1917			5,202	6	0			
„ LABORATORY—								
As at 31st December, 1917	£20,502	15	4					
Expenditure since		121	2	10				
						20,623	18	2
								31,478 1 6

N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual use of the Garden by the Society.

„ INVENTORY OF PLANT AND LOOSE EFFECTS—								
As taken by Mr. Chittenden						1,184	3	0
„ LIBRARY						270	9	0
								32,932 13 6

„ INVESTMENT OF DEPRECIATION AND RENEWALS RESERVE ACCOUNT—								
£2,981 11s. 10d. 3½% India Stock cost	£2,772	7	0					
£705 15s. 3d. 2½% Consols cost	415	8	10					
£650 5% War Loan cost	607	17	0					
						3,795	12	10
Add Cash for Investment, 1918						395	18	11
								4,191 11 9

„ INVESTMENTS—								
Great Eastern Railway Company 4% Debenture Stock £3,500			3,535	0	0			
Leopoldina Railway Company, Ltd. 5% Terminable Debentures £2,000			2,000	0	0			
City of Moscow Loan 1912. 4½% Bonds £6,000			5,730	0	0			
Buenos Ayres Great Southern Railway Company 5% Non-Cumulative Preference Stock £2,500			2,825	0	0			
War Stock 4½% 1925-45. £5,000			5,000	0	0			
Canadian Pacific Railway Company 4% Perpetual Consolidated Debenture Stock £4,632			3,890	17	6			
Consols 2½% £3,229 5s. 6d.			1,889	2	6			
London County Consolidated 3½% Stock £135 8s. 4d.			130	0	0			
						25,000	0	0

(In common with most pre-war Securities, the above have, for sale purposes, considerably depreciated, but for revenue purposes they bring in the same income as before.)

£62,124 5 3

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position on the 31st Dec., 1918.

ALFRED C. HARPER, F.C.A., Auditor,
(HARPER BROTHERS & FEATHER, Chartered Accountants),
35 Great Tower Street, London, E.C.

17th January, 1919.

Dr.

ALFRED DAVIS

Bequeathed to the Society in 1870 for Annual Prizes,

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917 . . .	1,797	8	9			
„ Dividends received 1917				50	10	6

WILLIAMS

Raised by Donations in 1891 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917 . . .	204	2	5			
„ Balance 31st December, 1917	204	2	5	29	17	3
„ Dividends received 1918				8	2	10
				38	0	1

MASTERS

Raised by Donations in 1908 in Memory of Dr. Masters

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917 . . .	542	17	0			
„ Balance 31st December, 1917	542	17	0	48	19	4
„ Dividends received 1918				19	5	0
				68	4	4

NICHOLSON

Raised by Donations in 1908 in Memory of

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917 . . .	160	12	11			
„ Dividends received 1918				6	3	2

SCHRÖDER

Provided by Royal Horticultural Society in Memory of the late Baron

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917 . . .	557	14	6			
„ Balance 31st December, 1917				7	1	8
„ Dividends received, 1918				19	10	0
				26	11	8

TRUST FUND.

Cr.

or in any other way the Council may determine.

	£	s.	d.	£	s.	d.
By Consols, £2,022 8s. 9d.	cost	1,797	8	9		
„ Revenue and Expenditure Account					50	10 6

MEMORIAL FUND.

B. S. Williams towards Prizes and Medals.

	£	s.	d.	£	s.	d.
By East India Railway Co. Annuity, Class B £7	168	0	0			
„ New South Wales Government 4 per cent. Inscribed Stock (1942-62) £36 3s. 1d.	36	2	5			
	204	2	5			
„ Balance in hands of R.H. Society				38	0	1
				38	0	1

MEMORIAL FUND.

towards the Provision of one or more Annual Lectures.

	£	s.	d.	£	s.	d.
By Midland Railway Consolidated 2½ per cent. Perpetual Preference Stock £400	290	13	6			
„ Midland Railway Consolidated 2½ per cent. Perpetual Guaranteed Preferential Stock £400	252	3	6			
	542	17	0			
„ Balance in hands of R.H. Society				68	4	4
				68	4	4

MEMORIAL FUND.

George Nicholson for Prizes to Wisley Students.

	£	s.	d.	£	s.	d.
By Tasmanian Government 4 per cent. Inscribed Stock (1940-50), £162 4s. 5d.	160	12	11			
„ Transfer to Wisley Prize Fund				6	3	2

PENSION.

Schröder to pay to Gardeners' Royal Benevolent Institution for one Pension.

	£	s.	d.	£	s.	d.
By Great Western Railway 4 per cent. Debenture Stock £500.	557	14	6			
„ Gardeners' Royal Benevolent Institution				20	0	0
„ Balance in hands of R.H. Society				6	11	8
				26	11	8

Dr.

LINDLEY LIBRARY

	£	s.	d.	£	s.	d.
To Amount of Fund 31st December, 1917.	6,231	18	10			
„ Contribution from R.H. Society, 31st December, 1918	36	3	5			

	6,268	2	3			
To Balance 31st December, 1917				10	9	6
„ Dividends and Donations received 1918				46	10	6
„ Contribution from R.H. Society, 31st December, 1918				53	0	0
				110	0	0

PRITZEL REVISION

Fund to be raised for the Revision of Pritzel's Iconum-

	£	s.	d.	£	s.	d.
To Amount of Fund, 31st December, 1917.	859	2	2			
„ Balance, 31st December, 1917				122	7	3
„ Dividends received 1918				32	17	11
„ Loan from R.H. Society, repayable				375	0	0
				530	5	2

TRUST.

C.

	£	s.	d.	£	s.	d.
By Lancashire and Yorkshire Railway 3 per cent. Consolidated Preference Stock £1,516 held by the Charity Commissioners	1,458	15	7			
„ Value of Library, 31st December, 1917	4,773	3	3			
„ Purchase of Books, 1918 (<i>See Report</i>)	36	3	5			
	6,268	2	3			
By Librarian's Salary				100	0	0
„ Balance in hands of R.H. Society				10	0	0
				110	0	0

FUND.

Botanicarum Index. Estimated cost, £3,500.

	£	s.	d.	£	s.	d.
By India 2½ per cent. Stock £1,307 13 6	859	2	2			
„ Amount expended, 1918				523	11	1
„ Balance in hands of R.H. Society				6	14	1
				530	5	2

SCHEDULE OF INVESTMENTS.

31st December, 1918.

			£	s.	d.
2½ %	Consols £5,324 19s. 8d.		cost	5,081	6 0
3 %	Local Loans £5,800		„	6,006	16 6
3½ %	Indian Rupee Paper 37,000 Rupees		„	2,462	14 4
3½ %	Dominion of Canada Registered Stock (1930-1950), £2,000		„	2,000	0 0
3½ %	London County Consolidated Stock £2,864 11s. 8d.		„	2,884	6 10
3½ %	India Stock £2,063 4s.		„	2,024	10 4
5 %	Havana Terminal Railroad Company Mortgage Debenture Bonds £8,300		„	8,946	0 0
4½ %	Central Argentine Railway, Limited, Consolidated Preference Stock £2,800		„	2,907	3 6
5 %	State of San Paulo Treasury Bonds (1913) £3,100		„	2,862	11 9
4 %	Central Argentine Railway, Limited, Debenture Stock £600		„	537	15 10
2½ %	India Stock £186 9s.		„	109	2 2
4 %	Mortgage on Freehold £1,000		„	1,000	0 0
5 %	War Loan, £9,500		„	9,274	18 2
				<u>£46,097</u>	<u>5 5</u>

GENERAL MEETING.

FEBRUARY 25, 1919.

Mr. A. W. SUTTON, V.M.H., in the Chair.

Fellows elected (45).—Mrs. R. T. Bakewell, F. G. Ball, H. W. Barber, R. N. Barwell, Mrs. Bellows, G. E. Blundell, Miss W. Bolus, Miss W. D. Brown, J. Cairnes, Lady Carson, Mrs. C. Colley, M. B. Davis, C. E. Dowdeswell, T. P. Edwards, G. Geale, Lieut. C. Grant-White, E. Grove, F. S. Harvey, Miss V. M. Hughes, Mrs. J. K. im Thurm, G. L. Jarrett, L. C. P. Jones, W. Julian, J. Kennedy, J. Little, J. W. Lomax, Mrs. E. L. Lovatt, J. H. Marsden, J. A. Paice, Major G. Palmer, B. Parry, Stanley Peck, Mrs. A. W. Perks, Miss C. Price, J. W. Rob, A. R. N. Rooksby, J. E. Taylor, J. J. Thompson, F. J. Varley, J. A. Waghorn, A. R. Wells, J. White, J. G. Wilson, A. C. Woodward, W. Wright.

Fellows resident abroad (3).—G. D. Bosshere, B. H. Moller, W. Smallman.

Associates (5).—Miss S. Barker, Miss M. B. Bindley, Miss M. French, Miss C. N. L. Motherwell, Miss J. Smallwood.

Societies affiliated (10).—Bournemouth (Borough of) Allotment Society, Cambridge and District Bee-keepers' Association, Cheadle Hulme Allotment Holders' Society, Douglas Horticultural Society, Henley in Arden District Allotment Society, Kimpton Horticultural Improvement and Cottage Gardening Society, Leadgate, Investon and District Amateur Gardeners' Society, Llanfoist Horticultural Society, Pontypool Allotment Holders' Association, Stratford-upon-Avon Allotment Association.

A lecture on "The Care of our Soldiers' Graves" was given by Capt. A. W. Hill, M.A. (p. 1).

GENERAL MEETING.

MARCH 11, 1919.

Mr. W. A. BILNEY, J.P., in the Chair.

Fellows elected (44).—Mrs. C. Allen, Mrs. H. Atherley-Jones, Miss A. R. Baring, R. Berks, Miss L. E. Blyth, T. W. Briscoe, Mrs. G. Bush, A. G. Carver, C. A. Corke, P. A. Culling, Lady Davies, M. B. Davie, Mrs. M. Debenham, Miss E. C. Diarmid, W. Dickinson, Lieut.-Col. E. G. Evans, H. S. Folley, D. Gidlow, Mrs. M. Gow, W. Harwood, W. M. Heald, J. Hefferman, Mrs. M. Herring, F. J. Ingleby, Mrs. I. Ingleby, N. E. Lamplugh, C. T. Lloyd, Mrs. E. A. C. Lloyd, C. E. Lovett, Mrs. E. K. Macmorran, D. C. Messant, Mrs. E. L. Midwood, E. Mobbs, Mrs. I. H. Rees Price, H. B. Saltmarsh, G. Shepperson, R. L. Soper, G. I. Stanbridge, F. T. Stokes, Dr. B. Taylor, G. H. Thomas, F. E. Trelawny, J. Weston, Mrs. L. D. Wigan.

Fellows resident abroad (5).—A. Deshumkh, Mrs. H. S. Harde, H. Howlett, V. G. Mandke, R. F. Silvers.

Associates (6).—A. H. Knight, S. Lion, Miss M. G. Penrose-Thackwell, Mrs. E. E. Stracey, W. J. Taylor, F. Usherwood.

Societies affiliated (8).—Aspatia Allotment Holders' Association, Bovey Tracey Horticultural Society, Cartland Road Allotment Association, Helensburgh Allotment Holders' Association, Hertford Horticultural Society, Long Eaton Garden Holders' Association, Orston, Elton, Thoroton Allotment Association, Stocksbridge and Deepcar Allotment Society.

A lecture on "The Public Parks of Glasgow" was given by Mr. J. Whitton, V.M.H. (p. 39).

GENERAL MEETING.

MARCH 25, 1919.

Sir ALBERT K. ROLLIT, LL.D., in the Chair.

Fellows elected (42).—H. T. Ann, Col. A. S. Barham, S. A. Baxter, Miss M. L. Boddam, Lady Helen Boyle, A. R. Cook, Mrs. V. M. Cooper, F. W. Crampton, Col. W. H. Faskin, Miss L. Franks, F. N. Garry, W. J. George, F. A. Gibbins, B. R. Goode, E. J. Guerin, J. Hamilton, M. Hutchins, A. O. Jefferys, F. Knight, P. Knight, Miss M. L. Lewis, Miss M. Van-Vleck Lidgerwood, Mrs. M. Longden,

XXX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Mrs. M. Lucy, G. W. Miles, Mrs. Mitchison, H. G. Moberly, E. W. Morris, Mrs. A. E. Neame, Miss E. Norton, W. H. Robbins, L. E. Roberts, Major W. R. Rook, J. C. Russell, R. F. McNair Scott, A. F. Smith, Lt.-Col. Soltau-Symons, Miss I. H. Stringer, Mrs. M. F. Vincent-King, Col. F. D. Watney, F. E. Winsland, R. Wittey.

Fellows resident abroad (1).—A. Davies, Sydney, Australia.

Associates (2).—Miss L. Jenkins, Miss A. F. Peake.

A lecture on "The Study of Economic Botany and the Professional Openings it offers" was given by Mr. E. White (p. 81).

Professor BICKERTON of New Zealand endorsed in the most emphatic terms all that the lecturer had said on the subject, and it was proposed by Sir ALBERT ROLLIT, seconded by Professor BICKERTON, and carried unanimously that a memorandum which had been prepared by the Secretary be sent to the Press.

Sir ALBERT ROLLIT, in proposing a vote of thanks to the lecturer, called attention to the great work being done by the Society in the direction of science as applied to Horticulture and Botany, and of the Society's need for a greatly increased Fellowship to help to meet the heavy financial burden which its work now involved (see also Annual Meeting). There was a unanimous expression of opinion at the Meeting which resolved that the Government should afford the Society financial support for its scientific and experimental work, and it was hoped that the Council would lose no time in taking steps to make representations to the Government in this direction. The vote of thanks to the lecturer was carried with acclamation.

GENERAL MEETING.

APRIL 8, 1919.

Mr. E. A. BOWLES, M.A., in the Chair.

Fellows elected (53).—J. E. Allnatt, Miss L. Benest, Mrs. A. Rond, H. Buchan, C. Cassidy, W. E. Catesby, H. Catchpole, G. Chambers, Mrs. A. Clarke, A. T. Collier, G. S. Colville, Lieut.-Col. H. Daly, J. K. Davies, Mrs. Dearmer, Miss A. A. Dunlop, Capt. R. Eliot, Mrs. H. England, Miss K. Forrest, Miss A. D. Francis, E. Goodyear, Miss Hannen, E. Harper, C. A. Harris, Col. W. C. Horsley, S. W. Jones, A. H. Lawrence, L. Lovell-Keay, Mrs. A. McCabe, W. H. Miles, H. Nevill, Miss E. M. Newbold, Mrs. J. H. Oxley, Mrs. Pilkington, A. W. Punnett, G. L. Radford, Col. W. C. Radford, Col. W. C. Riddell, Lady St. Audries, J. S. W. Saunders, E. Semper, A. Shambrook, J. A. Sinclair, R. J. M. Skarratt, Mrs. E. J. Stannard, W. B. Sweeting, A. T. Teniers, F. Thompson, C. L. Wallace, Capt. L. Wand, W. Whitehead, W. R. Wynton.

Societies affiliated (2).—Carnforth and District Gardeners' Association, Park and Dare Allotment Societies, Ltd.

A lecture on "Freesias and Lachenalias" was given by the Rev. J. Jacob (see p. 29).

GENERAL MEETING.

APRIL 29, 1919.

Lord LAMBOURNE, C.V.O., in the Chair.

Fellows elected (88).—F. D. Andrews, A. M. Anson, Miss E. S. Aspland, R. Bastin, N. T. Bengough, M. S. Bles, Mrs. P. Bristow, G. C. Bushby, Mrs. F. Chancellor, R. Collinson, Mrs. B. Cotton, F. W. Deas, Mrs. Deneke, R. J. P. Dix, G. A. Farnan, Lady Farquhar, Lady Farren, Mrs. F. Fraser, C. T. Gooch, B. Goodacre, Mrs. F. Gordon, Mrs. B. Goschen, Major A. B. Gracie, H. C. Green-grass, Mrs. E. Harding, G. C. Haslock, R. G. Hatton, Mrs. E. J. Hawes, J. T. Haynes, Mrs. J. A. Hirst, S. Hodgkin, J. Hodgson, Mrs. W. Hussey, Mrs. Hutt, O. A. Jenkins, H. Joy, P. C. Kay, Lady H. Keppel, P. V. Kerr, H. P. Kingham, Rev. A. L. Kynaston, Miss C. M. Lampard, H. W. Learoyd, T. A. M. Lockhart, S. H. Lord, J. Mackay, J. W. McKeachie, Major N. McLeod, Mrs. R. Makower, B. Martin, Lady Maxwell, A. J. Mayes, Lady Mayo-Robson, H. F. Mercer, D. Mooney, A. W. Morley, Mrs. M. R. Moser, Mrs. P. P. Ness, Mrs. G. Nevill, Duchess of Northumberland, D. C. Orr, E. Page, T. Parker, Miss L. Playfair, R. R. Pulling, Mrs. Purchase, Mrs. Shalless, J. Smith, Mrs. G. Somers-Smith, Miss H. Stokes,

H. Stowell, D. T. Thomas, F. H. Thompson, T. W. Tibbetts, Mrs. Usborne, A. J. Voisin, A. Wagg, Mrs. T. E. Walsh, Capt. F. Warrington-Strong, Mrs. A. C. Watts, L. Weaver, Mrs. I. Weaver, E. E. Wigan, D. Wilson, Mrs. H. Wilson, Mrs. E. A. Wood, H. S. Woodcock, Mrs. J. Young.

Fellows resident abroad (6).—P. Falk, S. T. Kawa, Miss D. H. MacRae, S. A. Moysard, Capt. S. Pickard, J. P. S. Sellschopp.

Associates (7).—T. Cannon, R. Hale, J. Heaton, S. Jones, R. Murrell, Miss H. M. Stephens, R. Sudell.

Societies affiliated (2).—Barnard Castle and District Allotment Holders' Association, Pilkington Allotment Holders' Association.

SCIENTIFIC COMMITTEE.

JANUARY 14, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and five members present.

Bulbils in Leek Inflorescence.—Mr. W. Cuthbertson showed a large inflorescence of the common Leek in which each of the flowers was replaced by one or more bulbils, as is frequent in many species of *Allium*. Mr. Cuthbertson, in a long experience, had never met with a similar case.

Substitute for Caraway seed.—Mr. Bowles showed seed of Dill, which is being used as a substitute for Caraway seed. In the opinion of the Committee there seems no reason why Caraway seeds should not be grown in England to supply all our requirements.

Fruits from Salonika.—Mr. Bowles also showed fruits of an Asclepiadaceous plant, which Mr. W. C. Worsdell took for identification.

Primula juliae hybrid.—Mr. Rosenheim sent a fine-flowered hybrid of *Primula juliae*, which had occurred in his garden, and which he thought might be a hybrid with *P. leucophylla*.

SCIENTIFIC COMMITTEE, JANUARY 28, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and five members present.

Fruits from Salonika.—Mr. W. C. Worsdell, F.L.S., reported that he had compared the fruits shown by Mr. Bowles at the last meeting with herbarium specimens, and had identified them as *Marsdenia erecta* and *Periplocu graeca*.

Flowers as aids to identification in Apple.—Mr. C. H. Hooper, F.S.I., drew attention to a series of photographs of Apple stamens and styles made in Victoria, Australia, and published in the *Journal of the Dep. of Agr. for Victoria*, and remarked upon the great range of variation in arrangement and form exhibited. Unfortunately not all the flowers had been photographed at the same stage of development, but there can be no doubt that floral details may be a great aid in the identification of Apple varieties, and also in all probability to their classification.

Rogues in Beet.—Mr. F. J. Baker, A.R.C.S., drew attention to the presence of long, fangy roots of a white colour in a crop of Beets grown from home-saved seed of a particularly good stock of Globe Beets in an allotment garden. It had been suggested that the result was due to crossing with Spinach, but it seems more likely that crossing with either Mangolds or some other variety of Beet had occurred, for it is well known that crossing readily occurs among Beets unless they are separated by very long distances. It is, of course, possible that segregation in the F_2 generation was occurring.

Pritzel Committee.—Mr. Bowles announced that the Council were about to appoint an official representative of the Scientific Committee to act upon the Pritzel Committee, and the name of Dr. A. B. Rendle, F.R.S., was suggested and unanimously approved. Dr. Rendle is now Professor of Botany to the Society.

Erythraea scilloides.—Mr. T. B. Rhys, of Tenby, wrote saying that he had discovered *Erythraea scilloides* growing wild in north Pembrokeshire. It had been identified at the British Museum and had never previously been recorded as wild in the British Isles.

SCIENTIFIC COMMITTEE, FEBRUARY 11, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and four members present.

Nectria cinnabarina.—Mr. E. A. Bowles showed a branch of an *Acer* covered with the numerous coral spots produced by this fungus in its fruiting stage. The fungus is exceedingly common on a variety of woody plants. It is a wound parasite, invading and killing the healthy tissue about the wound, and not producing its fruit until it has killed the wood invaded. The treatment consists

of cutting out the infected portions well behind the part on which the fungus fruits are produced and behind any parts showing a brown discoloration in the wood.

Hardy Maize.—Prof. R. C. Punnett, F.R.S., sent an exhibit showing ripe cobs of two varieties of Maize ripened in Cambridge, one yellow, the other cream, and both of the hard-corn type. These had been raised by him by crossing different varieties as recounted in *Gard. Chron.*, January 11, 1919. A Certificate of Appreciation was unanimously recommended for the work done by Prof. Punnett in raising these varieties.

Primula variabilis and *Narcissus Tazetta* var.—Mr. G. C. Druce sent specimens of the hybrid between *Primula vulgaris* and *P. veris* with small coloured flowers, often grown in gardens under the name *P. variabilis*, and found in abundance near Pulborough in an apparently wild state. He also sent a form of *Narcissus Tazetta*, near "Paper White," collected as an escape near Yiewsley, Middlesex.

SCIENTIFIC COMMITTEE, FEBRUARY 25, 1919.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair, and five members present.

Potato Disease.—Mr. F. J. Baker, A.R.C.S., drew attention to a common practice of throwing out partly diseased potato tubers when the clamps are opened in spring, and permitting them to lie about until much later. He considered these tubers a source of danger, in that growth might start and the disease occur upon it, spreading thence to shoots of plants cultivated near. He thought it wise to collect and destroy such tubers; they may be boiled and fed to pigs, when any danger would be removed, but they should not find their way into sties, &c., without previous cooking.

Artificial Production of Natural Hybrids.—Mr. R. A. Rolfe, A.L.S., showed a plant under the name of *Odontoglossum* × *Humeanum* Rehb. f. This had been raised by pollinating *O. maculatum* by *O. Rossii*. Reichenbach suggested *O. cordatum* and *O. Rossii* as the parents of the plant to which it is believed that he attached the name *O.* × *Humeanum*, but Mr. Rolfe can find no trace of *O. cordatum* in the wild plant or evidence that the two supposed parents grow together in the wild state. A plant was described after Reichenbach's *Humeanum* as *O.* × *asperum* Reich. f. and the parentage *O. maculatum* × *Rossii* ascribed. It was believed to be a natural hybrid, and the plant now exhibited is exactly identical. The plant originally called *O.* × *Humeanum* appears to have been lost. The plant exhibited was raised by Mr. Rolfe in the collection of F. H. Moore, Esq., Royal Infirmary, Liverpool, and has now, after nineteen years, flowered at Kew. A figure of the plant (*O.* × *Humeanum*) is given in *Reichenbachia*, ser. 1, ii. pp. 75–82, and the full history of the plant exhibited in *Orch. Rev.* xxvii. p. 4). The Committee unanimously recommended a Certificate of Appreciation to Mr. Rolfe for the work he had done in raising this plant.

Spiral Hazel.—Mr. Gurney Wilson, F.L.S., showed a stem of hazel from a railway cutting at Haywards Heath, Sussex, having a deep and broad spiral groove traversing it. Such grooves are usually the result of the growth of either honeysuckle or Clematis on the young stem.

Colouring of Leaves by Fungus Spores.—Mr. Bowles showed ivy leaves coloured deep brown by the presence of numerous spores of the fungus *Polyporus igneus*, which had formed its fruits upon the stem of a horse-chestnut above the ivy. The leaves were completely covered.

Narcissus aberrant.—Mr. J. K. Ramsbottom sent flowers of a Polyanthus *Narcissus* from Scilly in which the terminal flower of the inflorescence had in each case eight perianth pieces.

SCIENTIFIC COMMITTEE, MARCH 11, 1919.

Mr. E. A. Bowles, M.A., V.M.H., in the Chair, and five members present.

Odontoglossum × *asperum*.—Mr. G. Wilson, F.L.S., showed several early drawings of the plant known as *O.* × *Humeanum* and the alleged parents, and of *O.* × *asperum* and its parents.

Variations from Root Cuttings of Bouvardia.—Dr. W. Bateson, F.R.S., exhibited drawings of *Bouvardia* 'Bridesmaid,' and of the plant raised from it

bearing double flowers similar to the variety 'Hogarth,' exhibited at the meeting of the Committee in January 1916. He now showed drawings of a single form, raised from a root cutting of the form like 'Hogarth,' dissimilar to any cultivated at Merton. He also showed drawings of a Regal Pelargonium with another of a plant raised as a root cutting from it having flowers many shades deeper than the parent. Mr. Bowles said that he had met with a case of such variation in *Anchusa italica*. A white variety appeared, and on attempts being made to propagate it by root cuttings all (or most of) the plants came blue.

Seedlings of Myosotis 'Pride of Zurich.'—Dr. Bateson said that seedlings of the *Myosotis* form known as 'Pride of Zurich,' in which the petals have a white stripe down the centre, when the seed was obtained under protection from insect pollination all gave white flowers. The seedlings from plants raised in the open have either blue or white flowers, not striped ones. In one case a blue-flowered seedling bore a branch producing white flowers with a blue central stripe unlike anything before met with. The production of white-flowered seedlings suggested that the ovules were produced from the portion of the carpel corresponding with the white central stripe in *Myosotis 'Pride of Zurich.'*

Crocus with Markings of Outer like those of Inner Segments.—Mr. Bowles showed a *Crocus* having some of the outer segments without the feathered markings like those of the inner, one flower so differing had occurred on the same parent corm with a normally coloured one. Others had a portion of one of the outer segments half within the others and unfeathered, the other half, which had been exposed, being feathered.

Galanthus nivalis green-tipped.—Mr. Bowles also showed a fine flower of *Galanthus nivalis* with a green tip to the outer segments. Such forms appear to occur in all the species of *Galanthus* and are usually associated with a malformed spathe.

SCIENTIFIC COMMITTEE, MARCH 25, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, with three members present and Rev. J. JACOB, visitor.

"Breaking" of Freesias.—Rev. J. Jacob showed examples of *Freesia* flowers exhibiting the phenomenon, so well known in Tulips, of concentration of colour in certain areas, whereas the colour in flowers of the (vegetative) parent corm had been diffused. The example shown was in the variety 'Whitewell,' where the delicate tint of the parent had become intensified within a smaller area, and was not nearly so pleasing. He was unable to account for the change by any differences in cultivation or other causes.

Fruiting of Hedychium Gardnerianum.—Mr. J. Fitt, Frythe Gardens, Welwyn, Hertfordshire, sent a shoot of *Hedychium Gardnerianum* bearing fruit. At ripening, the fruit (which has been enclosed till then within the valves of the spathe) is exposed and its bright red valves burst apart, showing the black seeds on a red column within. The fruit is about 1 inch in length.

SCIENTIFIC COMMITTEE, APRIL 8, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and four members present.

Hybrid Freesias.—Mr. Dalrymple brought a large number of forms of *Freesia* which his brother, Mr. H. Dalrymple, had raised at Bartley, near Southampton. The range of colour was extraordinary, from yellow and bronze flowers to pink and purple. A Certificate of Appreciation was unanimously recommended to Mr. Dalrymple for work in raising these new *Freesias*.

A Multiple Flower of Narcissus.—From the same source came a flower of *Narcissus 'Minnie Hume'* with double the number of parts normally present.

Bamboos at Gunnersbury and Enfield.—Mr. Bowles showed specimens to illustrate the manner in which Bamboos had suffered from the weather during the past season, while Mr. J. Hudson, V.M.H., brought others from Gunnersbury in the best of condition. The climatic conditions in the two localities, though so near, must have been markedly different. Mr. Hudson attaches great importance to planting Bamboos in moist soil, never on banks.

SCIENTIFIC COMMITTEE, APRIL 29, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and three members present.

Insects pollinating mistletoe.—Mr. Bowles referred to the subject of insect-pollination of mistletoe, saying that he found certain insects persistently working the flowers, returning to them again and again, particularly Diptera, and he thought there could be no doubt that they were the agents effecting pollination. He had captured many and they had been identified at the British Museum as *Sepsis cynipsea* (4), *Chlorops* sp. (3), *Tephrochlamys rufiventris* (3), *Pyrellia lasiophthalma* (2), *Musca autumnalis* (1), *Scatophaga stercoraria* (1), *Elachyptera cornuta* (1). With one exception these were different flies from those captured at mistletoe last year (see JOURNAL R.H.S. xliv. p. xlix).

Malformed Cypripedium.—*Cypripedium* 'Euryades,' New Hall Hey var., with the dorsal part of the flower doubled, was sent by Mr. C. J. Lucas, of Horsham. Both dorsal sepal and rostellum were paired.

Wood of Cecropia.—A piece of stem of *Cecropia* was sent by Mrs. G. E. Bullar, picked up on the shore at L'Islet, Guernsey. The wood is extremely light and has large pith cavities with transverse walls at intervals of about two inches. Dr. Rendle, who identified the specimen, says that the pith cavities are, in the young stem, often occupied by ants, and that the natives of W. Indies and S. America, where the tree grows wild and reaches a height of from 40 to 60 feet and a diameter of a foot, use the hollow stems as wind instruments, whence the name 'Trumpet-Wood.'

FRUIT AND VEGETABLE COMMITTEE.

JANUARY 14, 1919.

Mr. C. G. A. NIX in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for hardy winter vegetables.

Silver Knightian Medal.

To Mr. R. Staward, Panshanger, for Leeks.

Other Exhibit.

Mr. H. Close, Orpington : Apple 'Gunner Buckwell.'

FRUIT AND VEGETABLE COMMITTEE, JANUARY 28, 1919.

Mr. C. G. A. NIX in the Chair, and fifteen members present.

It was unanimously resolved to send a vote of condolence to the family of the late Mr. George Bunyard, V.M.H., who was for so many years the deeply respected Chairman of this Committee.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Lady Elizabeth Dawson, Maidenhead, for bottled fruits and vegetables.

First-class Certificate.

To Apple 'St. Cecilia' (votes unanimous), from Messrs. Basham, Bassaleg, nr. Newport. This variety received an Award of Merit on January 15, 1918. Fruit of medium size, even in outline, but of different shapes, some conical, others flat; skin yellow and nearly covered with red, with a good deal of russet round the stalk; eye small, and nearly closed in a shallow and slightly plaited saucer; stalk about half an inch long, inserted in a small funnel set in a very full base; flesh crisp, juicy, fine flavour, somewhat resembling that of 'Cox's Orange Pippin,' which is one of its parents, the name of the other parent having been lost. The tree is said to be a strong, vigorous grower, and a free bearer, a very promising variety that should be a valuable addition to our late dessert Apples. (See JOURNAL R.H.S., xlv. p. lv., fig. 36).

Other Exhibits.

Messrs. Whitelegg, Chislehurst : Onions.

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 11, 1919.

Mr. C. G. A. NIX in the Chair, and eleven members present.

Awards Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for winter vegetables.

Previous Awards Confirmed.

To Mr. V. Banks, Food Production Department, for bottled fruits and vegetables.

Other Exhibits.

Mr. P. Chennell, Dorking : seedling Apple.
 , Mr. W. Peters, Leatherhead : Onion 'Globe Keeper.'

FRUIT AND VEGETABLE COMMITTEE, FEBRUARY 25, 1919.

Mr. C. G. A. Nix in the Chair, and fifteen members present.

No awards were recommended on this occasion.

Exhibit.

Messrs. Laxton, Bedford : Apple 'Laxton's Superb.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 11, 1919.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Award Recommended :—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Mr. J. Leeder, Postwick : Apple 'Leeder's Perfection.'
 R.H.S. Gardens, Wisley : early Rhubarb and Apple 'Surecrop.'
 Mr. G. G. Whitelegg, Chislehurst : Onion 'Cooper's Density.'

FRUIT AND VEGETABLE COMMITTEE, MARCH 18, 1919.

SUB-COMMITTEE AT WISLEY.

Mr. W. POUPART in the Chair, and four members present.

The Sub-Committee inspected the trial of Kales and made recommendations for awards.

FRUIT AND VEGETABLE COMMITTEE, MARCH 25, 1919.

Mr. J. CHEAL, V.M.H., in the Chair, and twelve members present.

Awards Recommended :—

The following-awards recommended by the Sub-Committee to Kales on trial at Wisley were confirmed :—

Award of Merit.

No. 64. Ormskirk Hearting Curled Greens, sent by Mr. Clucas.

Highly Commended.

No. 1. Cottager's Kale, sent by Messrs. R. Veitch ; No. 7. Dwarf Purple Curled, sent by Messrs. Barr ; No. 22. Extra Curled Scotch, sent by Messrs. Sutton ; No. 41. Favourite, sent by Messrs. Sutton ; No. 35. Green Curled, sent by Messrs. Sydenham ; No. 46. Improved Hearting, sent by Messrs. Sutton ; No. 29. Purple Plume, sent by Messrs. Carter ; No. 27. Scotch Kale Selected, sent by Messrs. Barr ; No. 13. Jerusalem Purple, sent by Messrs. Barr ; No. 55. Variegated Kale Selected, sent by Messrs. Barr, and recommended as a decorative variety.

Other Exhibits.

Mr. J. Leeder, Postwick : Apple 'Leeder's Perfection.'
 W. G. Rigden, Esq., Englefield Green : Potatos and Onion 'Royal Keeper.'

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FRUIT AND VEGETABLE COMMITTEE, APRIL 8, 1919.

Mr. C. G. A. NIX in the Chair, and eleven members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for vegetables.

FRUIT AND VEGETABLE COMMITTEE, APRIL 29, 1919.

Mr. C. G. A. NIX in the Chair, and eleven members present.

There were no exhibits before the Committee on this occasion.

FLORAL COMMITTEE.

JANUARY 14, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. May, Upper Edmonton, for ferns and Cyclamen.

Silver Banksian Medal.

To Messrs. Low, Enfield, for Carnations.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Piper, Langley, for shrubs and alpine.

Bronze Banksian Medal.

To Mr. G. Reuthe, Keston, for hardy plants.

First-class Certificate.

To *Cotoneaster serotina* (votes 11 for, 4 against), from the R.H.S. Gardens, Wisley. A very useful ornamental shrub from China growing from 4 to 6 feet high and of graceful habit. The leaves are ovate, apiculate, from 1½ to 2 inches long and nearly an inch broad. They have prominent midribs and the under sides are glaucous. The small, round, scarlet fruits are borne in corymbs along the long arching branches of the plant.

Other Exhibit.

R.H.S. Gardens, Wisley: *Pyracantha Gibbsii* to show the persistence of the fruits.

FLORAL COMMITTEE, JANUARY 28, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—*Silver Flora Medal.*

To R. L. Mond, Esq. (gr. Mr. C. Hall), Sevenoaks, for Primulas &c.

Bronze Flora Medal.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Piper, Langley, for shrubs and hardy Cyclamen.

Bronze Banksian Medal.

To Messrs. Carter, Raynes Park, for *Primula malacoides*.

To Messrs. Felton, London, for Eucalyptus and Cytisus.

Award of Merit.

To *Primula malacoides* 'The President' (votes 12 for, 1 against), from Messrs. Carter, Raynes Park. A good, pale rosy-lilac, double form of this well-known greenhouse Primula.

Other Exhibits.

Messrs. Chapman, Rye: Freesias.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. Reuthe, Keston: hardy plants.

Mr. Rosenheim, East Molesey: *Primula* 'Juliana.'

FLORAL COMMITTEE, FEBRUARY 11, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cheal, Crawley, for Conifers.

Silver Flora Medal.

To Messrs. Barr, Covent Garden, for Cyclamen.

Silver Banksian Medal.

To Mr. G. W. Miller, Wisbech, for hardy plants.

Other Exhibits.

Messrs. H. Chapman, Rye : Freesias.

Misses Hopkins, Shepperton : hardy plants.

Messrs. Low, Enfield : Carnations.

FLORAL COMMITTEE, FEBRUARY 25, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Low, Enfield, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Mr. G. W. Miller, Wisbech, for Spring flowers.

To Messrs. Piper, Langley, for hardy plants.

To Mr. G. Reuthe, Keston, for rare Conifers.

Bronze Flora Medal.

To Messrs. H. Chapman, Rye, for Irises and Freesias.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants.

To Mr. G. G. Whitelegg, Chislehurst, for alpine.

Award of Merit.

To Freesia 'Merry Widow' (votes 16 for, 2 against), from Rev. J. Jacob, Whitchurch, Salop. A very large-flowered variety. The ground colour is white suffused with pale violet-lilac. The latter colour is also seen in the lines in the throat, and there is a patch of golden yellow on the lower segment of the flower. It is said to be a tall-growing variety and excellent as a pot plant.

To Freesia 'Rose Beauty' (votes unanimous), from Rev. J. Jacob, Whitchurch, Salop. A dainty variety of a very deep rose-pink colour. The white throat is lined with rose and the lower segment of the flower has a touch of gold when first opened. This variety is a great advance in colour.

To *Primula malacoides* 'Princess Patricia' (votes 20 for), from Messrs. Carter, Raynes Park. This variety of *Primula malacoides* is of good habit and very free-flowering. The flowers are rosy-mauve in colour and three-quarters of an inch or more in diameter.

Other Exhibits.

Messrs. Barr, London : hardy plants.

Misses Hopkins, Shepperton : hardy plants.

FLORAL COMMITTEE, MARCH 11, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Gill, Falmouth, for Rhododendrons and Arums.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Messrs. Waterer, Sons & Crisp, Twyford, for alpiners.

Bronze Flora Medal.

To Messrs. Cheal, Crawley, for shrubs.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Messrs. Piper, Langley, for shrubs and alpiners.

To Messrs. Tucker, Oxford, for alpiners.

Bronze Banksian Medal.

To Messrs. Low, Enfield, for Carnations.

To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Freesia 'Daddy-long-legs' (votes unanimous), from Rev. J. Jacob, Whitchurch, Salop. The flowers of this charming Freesia are large, sweetly scented, and rosy-mauve in colour with a golden-orange blotch on the lower segment. The segments are somewhat reflexed, so that the blooms are much more open than usual. This variety is a very tall grower, hence its name.

Other Exhibits.

Messrs. Chapman, Rye : Freesia 'Opal.'

G. Ferguson, Esq., Weybridge : Freesias.

Misses Hopkins, Shepperton : hardy plants.

Mr. G. G. Whitelegg, Chislehurst : alpiners.

FLORAL COMMITTEE, MARCH 25, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Cuthbert, Southgate, for Azaleas.

To Messrs. Gill, Falmouth, for Rhododendrons &c.

To Messrs. Tucker, Oxford, for alpiners.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. G. Prince, Longworth, for Roses.

To Messrs. Waterer, Sons & Crisp, Twyford, for alpiners.

Bronze Flora Medal.

To Messrs. Piper, Langley, for shrubs and alpiners.

Bronze Banksian Medal.

To Mr. G. W. Miller, Wisbech, for Primroses.

To Messrs. Peed, West Norwood, for Cyclamens.

To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Freesia 'Pinkie' (votes 15 for, 4 against), from Rev. J. Jacob, Whitchurch, Salop. This variety represents a great advance in colour in Freesias. The

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shade is a good clear pink and the blooms are of medium size but not highly scented.

To *Saxifraga lilacina* (votes 18 for), from Messrs. Tucker, Oxford. A beautiful alpine species from the Himalaya. Its tiny foliage forms dense, grey-green tufts which are studded with the comparatively large rose-lilac flowers.

Other Exhibits.

Messrs. Cheal, Crawley : hardy plants.

Mr. J. Fitt, Welwyn : *Rhododendron Veitchianum*.

Misses Hopkins, Shepperton : hardy plants.

Messrs. Low, Enfield : Carnations.

P. Rosenheim, Esq., East Molesey : Primulas.

Mr. G. G. Whitelegg, Chislehurst : alpinas.

FLORAL COMMITTEE, APRIL 8, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Mr. E. J. Hicks, Twyford, for Roses.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Tucker, Oxford, for alpinas.

Silver Banksian Medal.

To Messrs. Cutbush, Barnet, for Carnations &c.

To Messrs. Low, Bush Hill Park, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. G. W. Miller, Wisbech, for Polyanthus &c.

To Mr. G. Prince, Longworth, for Roses.

To Mr. L. R. Russell, Richmond, for Azaleas &c.

Bronze Flora Medal.

To Messrs. Piper, Langley, for alpinas.

To Mr. G. Reuthe, Keston, for hardy plants.

To R.H.S. Gardens, Wisley, for alpinas.

Bronze Banksian Medal.

To Misses Hopkins, Shepperton, for hardy plants.

Award of Merit.

To *Freesia* 'Bartley Mauve' (votes 21 for), from Mr. H. Dalrymple, Bartley, Southampton. A large-flowered, sweetly scented, violet-mauve variety of excellent form.

To *Freesia* 'Bartley Rose' (votes 19 for, 3 against), from Mr. H. Dalrymple, Bartley, Southampton. The flowers of this variety are large and of a rosy-mauve colour, which also runs in lines into the white tube.

To *Freesia* 'Goldfinch' (votes unanimous), from Mr. H. Dalrymple, Bartley, Southampton. A beautiful golden-yellow variety with a deep orange blotch on the lower segment. The flowers are of good size and sweetly scented.

To *Primula* 'Wanda' (votes 12 for), from Messrs. Baker, Codsall. This hybrid *Primula* is the result of a cross between *Primula juliae* and a crimson form of the common Primrose (*P. acaulis*). The plant has a neat and robust habit and the leaves are rounder and somewhat shorter than those of *P. acaulis*. The flowers which are borne in great abundance, are of a bright purplish-crimson colour with a golden eye, and they are of large size. This is the most striking of the many hybrids resulting from this cross so far exhibited.

Cultural Commendation.

To Miss C. Warner, Belle Orchard, Hawkhurst, for *Richardia africana*.

Other Exhibits.

Messrs. Cheal, Crawley : Primulas and hardy plants.
 Mrs. Lloyd Edwards, Ruabon : Saxifrages and hybrid Primula.
 Messrs. Paul, Cheshunt : Rhododendron 'Paul's Early Blush.'
 Mr. J. H. Wood, Boston Spa : Saxifraga 'Boston Spa Seedling.'

FLORAL COMMITTEE, APRIL 29, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Allwood, Haywards Heath, for Carnations.
 To Messrs. Gill, Falmouth, for Rhododendrons.
 To Mr. L. R. Russell, Richmond, for Azaleas &c.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.
 To Messrs. Cuthbert, Southgate, for Azaleas.
 To Messrs. Low, Bush Hill Park, for Carnations &c.
 To Messrs. May, Upper Edmonton, for ferns and flowering plants.
 To Mr. G. W. Miller, Wisbech, for hardy plants.
 To Messrs. Piper, Langley, for alpinists.

Bronze Flora Medal.

To Adeline, Duchess of Bedford, Chenies, for Primula 'Eureka' hybrids.
 To Messrs. Cutbush, Highgate, for Carnations.
 To Mr. M. Prichard, Christchurch, for alpinists.
 To Mr. G. Reuthe, Keston, for hardy plants.
 To Messrs. Tucker, Oxford, for alpinists.
 To Miss C. Warner, Hawkhurst, for Arums.

Bronze Banksian Medal.

To Mr. J. Fitt, Welwyn, for *Rhododendron fragrantissimum*.
 To Misses Hopkins, Shepperton, for hardy plants.

Award of Merit.

To *Aubrietia rosea splendens* (votes 11 for), from Mr. M. Prichard, Christchurch. This useful addition to the Aubrietias has bright rose flowers measuring 1 inch across and is very free-flowering.

To *Rhododendron* 'Madame G. Verde Delisle' (votes 12 for, 3 against), from T. H. Lowinsky, Esq., Sunninghill. This variety is the result of a cross between *Rhododendron* 'Doncaster' and *R. Aucklandii*. The flowers which measure 4 inches across are a very bright deep-pink colour, and are borne in trusses of about eight blooms. The centre is lighter in colour and spotted with brown.

To *Rhododendron* 'Miss Adelaide Clow' (votes 11 for, 1 against), from T. H. Lowinsky, Esq., Sunninghill. The flowers of this variety are white flushed with pink and have a few chocolate spots on the upper segment. The blooms measure 4 inches across and are borne in trusses of about twelve. The buds are quite pink. This variety resulted from a cross between *Rhododendron* 'White Pearl' and *R. Aucklandii*.

To *Rhododendron* 'Mrs. Tom Lowinsky' (votes unanimous), from T. H. Lowinsky, Esq., Sunninghill. This magnificent variety was also raised by crossing *Rhododendron* 'White Pearl' and *R. Aucklandii*. Its flowers are very large, measuring 4½ inches across, white flushed with pink on the outside, flattish, and are borne in trusses of about eight.

To *Rhododendron* 'Xenia' (votes 9 for, 1 against), from T. H. Lowinsky, Esq., Sunninghill. The parents of this variety are *Rhododendron* 'Helen Schiffner' and *R. Mrs. Charles Butler*. The flowers are 3 inches across, white with crimson lines at the base, and are borne in trusses of about twelve.

Other Exhibits.

Miss Bayne, Bridge of Allan : Clematis 'Miss Bayne.'
 Mr. C. Elliott, Stevenage : Primula 'Mrs. Wilson.'
 Messrs. Godfrey, Exmouth : strain of *Schizanthus*.
 Messrs. Paul, Cheshunt : Rhododendrons.

ORCHID COMMITTEE.

JANUARY 14, 1919.

Sir JEREMIAH COLMAN, Bart., in the Chair, and twenty-three members present.

Awards Recommended :—

Gold Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Odontoglossums* and *Odontiodas*.

Silver Flora Medal.

To Messrs. McBean, Cooksbridge, for *Cymbidiums* and other hybrids.

To Messrs. Stuart Low, Jarvisbrook, for *Laeliocattleyas* and *Sophrocattleyas*.

Silver Banksian Medal.

To Messrs. Cypher, Cheltenham, for hybrid *Cypripediums*.

Award of Merit.

To *Cypripedium* × 'Perseus' ('Lady Dillon' × 'Alcibiades illustris') (votes unanimous), from W. R. Lee, Esq., Plumpton Hall, Heywood, Lancashire (gr. Mr. Branch). Dorsal sepal white with spotted lines of dark claret colour. Petals and lip brownish-rose with yellow margin.

Preliminary Commendation.

To *Odontoglossum* × 'Princess Patricia' ('Dora' × *crispum Luciani*) (votes 16 for, 0 against), from Messrs. Armstrong & Brown. Inner two-thirds of the segments blotched dark Indian red, the rest white.

To *Odontoglossum* × 'Triumph' (*ardentissimum* × *Ossulstonii*) (votes 18 for, 0 against), from Messrs. Armstrong & Brown. A fine blush-white seedling heavily blotched with claret-red.

Other Exhibits.

Sir Jeremiah Colman, Bart. : *Laeliocattleyas*.

G. W. Bird, Esq. : *Odontioda* × 'The Sphinx' (parentage unrecorded).

Baron Bruno Schroeder : *Brassocattleya* × *Cliftonii albens*.

E. R. Ashton, Esq. : *Sophrolaeliocattleya* × 'Isabella.'

Messrs. Flory & Black : *Odontoglossums*.

Messrs. Sanders : *Cymbidium* × 'Atalanta.'

ORCHID COMMITTEE, JANUARY 28, 1919.

Sir JEREMIAH COLMAN, Bart., in the Chair, and twelve members present.

Awards Recommended :—

Gold Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for over one hundred specimens of hybrid *Cymbidiums*, *Calanthes*, *Odontiodas*, and *Odontoglossums*.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Award of Merit.

To *Odontoglossum* × *ardentissimum* 'Reine Blanche' (*crispum xanthotes* × *Pescatorei album*) (votes unanimous), from Dr. Craven Moore, Victoria Park,

Manchester. Flowers large, pure white with a few straw-yellow spots on the lip.

Other Exhibits.

Frederick J. Hanbury, Esq.: three hybrid *Cypripediums*.
 Dr. Miguel Lacroze: *Cypripedium* × 'Isonzo' Bryndir variety.
 Baron Bruno Schröder: *Cypripedium* × 'Eurybiades Helmuth.'
 Mrs. Norman Cookson: *Cypripedium* × 'Oakwood Giant.'
 Messrs. Flory & Black: *Sophrocattleyas*.
 Messrs. McBean: hybrid *Cattleyas*.

ORCHID COMMITTEE, FEBRUARY 11, 1919.

Sir JEREMIAH COLMAN, Bart., in the Chair, and thirteen members present.

Awards Recommended :—

Award of Merit.

To *Odontoglossum* × 'Gatton Emperor' var. 'Tiberius' (*Lambeauiianum* × hybrid unrecorded) (votes unanimous), from Sir Jeremiah Colman, Bart., Gatton Park, Surrey (gr. Mr. Collier). A darker violet-purple variety of the type which was given an Award of Merit, February 12, 1918.

To *Odontoglossum* × 'Empire' (*eximium* × 'Marathon') (votes 10 for, 0 against), from Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells. Flowers large, blotched with claret-red on white ground.

To *Odontoglossum crispum* 'The Marquis' (votes 9 for, 0 against), from Messrs. Charlesworth, Haywards Heath. A home-raised seedling of good quality, pure white, petals and lip fringed.

To *Odontoglossum* × 'Radiant' ('Dora' × 'Alexandra') (votes 10 for, 0 against), from Messrs. Charlesworth. Flower of *O.* × 'Jasper' type; large, rose finely marked with dark claret.

To *Odontoglossum* × 'St. George' (*eximium* × 'Alexandra') (votes 8 for, 0 against), from Messrs. Charlesworth. A fine flower with white ground, blotched with dark mauve.

To *Brassolaeliocattleya* × 'Imogen' (*B.-c.* × *langleyensis alba* × *L.-c.* × 'Trimyra') (votes 7 for, 0 against), from Messrs. Flory & Black, Slough. Flowers, of *Cattleya* form, white with yellow disc and fringed margin to the lip.

Cultural Commendation.

To Mr. Farnes, Orchid Grower to Pantia Ralli, Esq., Ashted Park, for *Cymbidium* × *Gottianum* (*insigne* × *eburneum*) with six spikes, bearing together twenty-five flowers.

Other Exhibits.

Messrs. Armstrong & Brown: new *Odontoglossums* and *Odontiodas*.
 Messrs. Charlesworth: rare hybrids.
 Messrs. Flory & Black: new *Odontoglossums*.
 Messrs. Sanders: hybrids and rare species.
 Baron Bruno Schröder: varieties of *Cypripedium* × 'Eurybiades.'

ORCHID COMMITTEE, FEBRUARY 25, 1919.

Sir HARRY J. VEITCH in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Cymbidiums*, *Odontoglossums*, and *Odontiodas*.

To Messrs. Charlesworth, Haywards Heath, for *Cattleyas*, *Laeliocattleyas*, and *Odontoglossums*.

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for hybrids and rare species.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for hybrid Cymbidiums and Odontoglossums.

To Messrs. Hassall, Southgate, for hybrid Cymbidiums.

First-class Certificate.

To *Brassocattleya* × 'Princess Patricia' (*C.* × 'Enid' × *B.-c.* × *Cliftonii magnifica*) (votes unanimous), from Messrs. Charlesworth. A fine flower with the features of the *Brassocattleya* parent. Sepals and petals light rose colour; lip Tyrian purple in front; disc chrome-yellow.

Award of Merit.

To *Laeliocattleya* × 'Zeno' var. 'Lyoth' (*L.-c.* × 'St. Gothard' × *C.* × *Luegeae*) (votes 14 for, 0 against), from Messrs. Charlesworth. A large and well-formed rose flower with rich purple lip, having gold lines from the base.

To *Cymbidium* × 'International' (*eburneo-Lowianium* × *Woodhamsianum*) (votes 11 for, 0 against), from Messrs. Armstrong & Brown. Flowers large and of fine substance; primrose-yellow with purple spotting on the lip.

To *Cymbidium* × *albanense*, McBean's var. (*erythrostylum* × *insigne*) (votes 13 for, 0 against), from Messrs. McBean. Flowers blush-white with purple dotted lines on the lip.

To *Laeliocattleya* × *Rex* (*L.-c.* × *Haroldiana* × *C.* 'Tityus Rex') (votes unanimous), from Messrs. Flory & Black, Slough. A large and showy hybrid with broad, crimped sepals and petals of rosy-mauve colour; lip ruby-purple with yellow disc and basal lines.

Cultural Commendation.

To Mr. J. Collier, gr. to Sir Jeremiah Colman, Bt., for *Cymbidium* × *Lowio-grandiflorum*, with a spike of twenty-nine flowers.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Odontoglossum* × 'Gatton Princess.'

Dr. Miguel Lacroze: *Laeliocattleya* × 'Beatrice' var. 'Roehampton.'

Sir Mervyn Buller: *Cattleya* × 'Clotho,' and *C. Trianae alba*.

Messrs. Flory & Black: hybrids.

ORCHID COMMITTEE, MARCH 11, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier), for hybrid Dendrobiums and rare species.

To A. C. Feaver, Esq., South Norwood (gr. Mr. Rodgers), for hybrid Cymbidiums.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Odontiodas* and new *Odontoglossums*.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums* and *Laeliocattleyas*.

To Messrs. McBean, Cooksbridge, for Cymbidiums and other hybrids.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for *Laeliocattleyas* and *Sophranitis* crosses.

First-class Certificate.

To *Brassocattleya* × 'Gatton Lily' var. 'Purity' (*C. Trianae albens* × *B.-c.* × *Digbyano-Mendelii* var. 'Fortuna') (votes unanimous), from Sir Jeremiah Colman, Bt. A fine pure white variety of the original which was given a **F.C.C.** December 3, 1918.

Award of Merit.

To *Odontoglossum* × 'Philomene' var. 'Mauretania' (*Rolfeae majesticum* × *percultum* 'Olympia') (votes unanimous), from Messrs. Charlesworth. Flower large, pale yellow, blotched with purple. Lip broad as long, flat, white with purple spotting at the base.

To *Odontoglossum* × 'Pyramus' ('Louise' × 'l'Empereur') (votes 17 for, 0 against), from Messrs. Charlesworth. Flower of good shape, white, heavily blotched with reddish-claret colour.

To *Odontoglossum* × 'Peerless' *auriferum*, Rosslyn var. (*Ossulstonii* × *eximium*) (votes 17 for, 0 against), from H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood). Ground colour pale yellow with chocolate blotches.

Preliminary Commendation.

To *Odontioda* × 'Lady Patricia Ramsay' (*Odm.* × *Lambeauianum* × *Oda.* × 'Coronation') (votes 17 for, 0 against), from Messrs. Armstrong & Brown. Flower of good size and shape, heavily blotched with bright red.

To *Odontoglossum* × 'General Foch,' Orchidhurst var. (*Armstrongiae* × 'Colossus') (votes 17 for, 0 against), from Messrs. Armstrong & Brown. Sepal and petals white, heavily blotched with purplish-red.

Other Exhibits.

Pantia Ralli, Esq.: *Sophrolaeliocattleya* × 'His Majesty,' Ralli's variety.

Messrs. Flory & Black: *Sophronitis* hybrids and *Odontoglossums*.

H. S. Goodson, Esq.: *Odontoglossum* × *Goodsonianum* (*Rossii* × ?).

ORCHID COMMITTEE, MARCH 25, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen members present.

Awards Recommended :—*Silver Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for Cattleyas and Laeliocattleyas.

To Messrs. McBean, Cooksbridge, Sussex, for Cymbidiums and Laeliocattleyas.

To Messrs. Sander, St. Albans, for *Odontiodas* and *Odontoglossums*.

Award of Merit.

To *Laeliocattleya* × 'Lady Evelyn' (*L.-c.* × 'Goldfinch' × *C.* × 'Empress Frederick') (votes unanimous), from Sir Jeremiah Colman, Bt. (gr. Mr. J. Collier). In shape resembling the Cattleya parent. Sepals and petals rose; lip ruby-purple with yellow disc and basal lines.

To *Odontioda* × 'St. André' (*Oda.* × *Sanderæ* × *Odm.* × *amabile*) (votes unanimous), from Messrs. Sander. Ground colour pale yellow effectively blotched with bright red.

To *Odontoglossum* × 'Vardar' (*mirificum* × *eximium*) (votes 15 for, 0 against), from Messrs. Flory & Black, Slough. Flowers white heavily blotched with claret-red, the broad white margin being clearly defined.

Preliminary Commendation.

To *Odontoglossum* × 'Pallas' (*illustrissimum* × 'Doris') (votes 15 for), from Messrs. Flory & Black. Flower closely blotched with dark purple, the white ground showing between the blotches.

To *Odontioda* × 'Marvel' (*Oda.* × *Bradshawiae* × *Odm.* × 'Mars') (votes 9 for, 3 against), from Messrs. Armstrong & Brown. A finely formed crimson flower with slight white margin.

Other Exhibits.

Sir Jeremiah Colman, Bt.: hybrid *Dendrobiums*.

Messrs. Armstrong & Brown: new *Odontiodas* and *Odontoglossums*.

E. R. Ashton, Esq.: hybrid *Odontoglossums* and *Odontiodas*.

H. T. Pitt, Esq.: *Miltonia* × *Bleuana*, Hessle variety.

Messrs. Flory & Black: *Odontoglossums*.

ORCHID COMMITTEE, APRIL 8, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrids, including new *Odontiodas* and *Odontoglossums*.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for hybrids and interesting species.

To Messrs. Charlesworth, Haywards Heath, for hybrids and new *Odontoglossums*.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for *Cymbidiums*, *Odontoglossums*, and *Odontiodas*.

Award of Merit.

To *Odontioda* × 'Gladys' *superba* (*Odm. Pescatorei* × *Oda.* × *Bradshawiae*) (votes unanimous), from Dr. Craven Moore, Victoria Park, Manchester. A showy flower, with white ground effectively marked with red.

To *Odontioda* × 'Margaret,' Gatton Park var. (*Oda.* × *Bradshawiae* × *Odm. × ardentissimum*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park, Surrey (gr. Mr. Collier). Flower of good size and shape, mahogany-red with a light violet shade and slight white markings at the margin.

To *Miltonia* × 'Venus' Orchidhurst var. (*vexillaria* × *Phalaenopsis*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers as large as those of *M. vexillaria*. Sepals and petals pale lilac. Lip white with spotted lines of ruby red extending from the yellow base to the centre.

Cultural Commendation.

To Dr. Craven Moore, for *Odontioda* × 'Gladys' *superba* with two spikes bearing together fifty-four flowers.

Other Exhibits.

Sir Jeremiah Colman, Bt. : fine forms of *Lycaste Skinneri*.

Col. Stephenson R. Clarke, Cuckfield : *Lowara* × 'Paul' (*Sophrolaelia* × *Psyche* × *Brassolaelia* × 'Mrs. M. Gratrix').

C. J. Lucas, Esq. : *Laeliocattleyas* and *Odontoglossums*.

ORCHID COMMITTEE, APRIL 29, 1919.

Sir HARRY J. VEITCH in the Chair, and fifteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid *Odontoglossums* and *Odontiodas*.

To Messrs. Charlesworth, Haywards Heath, for a group.

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Cattleyas* and *Laeliocattleyas*.

Silver Banksian Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill, for hybrids and rare species.

To E. R. Ashton, Esq., Tunbridge Wells, for *Odontoglossums*.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Odontioda* × 'Lady Veitch' (*Oda.* × *Cooksoniae*, Orchidhurst var. × *Odm.* × 'Mars') (votes unanimous), from H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood). A superb hybrid with flower four inches across and

of perfect shape. Sepals and petals Indian Red with a gold shade. Lip white, with a ruby-red blotch in front of the yellow crest. The variety was raised by Messrs. Armstrong & Brown.

Award of Merit.

To *Odontoglossum* × 'The Tiger' (*Lawrenceanum* × 'Stella') (votes unanimous), from H. T. Pitt, Esq. The largest of the *O. triumphans* class, that species being in both parents. Ground colour yellow heavily blotched with red-brown.

To *Odontoglossum* × *Ashtonti* (*amabile* × hybrid unrecorded) (votes unanimous), from E. R. Ashton, Esq., Broadlands, Tunbridge Wells. Flower large, white with the inner two-thirds of the segments blotched with dark purple.

To *Odontoglossum* × 'Radiant' var. 'Marion' ('Dora' × 'Alexandra') (votes 7 for, 3 against), from Messrs. Flory & Black, Slough. Flower violet-purple with blush-white blotches at the tips and margin.

To *Cattleya* × 'Rajah' ('Enid' × 'Empress Frederick') (votes 10 for, 2 against), from Messrs. Stuart Low, Jarvisbrook, Sussex. Resembling the parents but with a reversion towards the *C. Warscewiczii* in *E.* × 'Enid.' Flowers rose colour with large crimson lip.

Preliminary Commendation.

To *Odontioda* × 'Signor Orlando' (*Odm.* × 'Jasper' × *Oda* × *Bradshawiae*) (votes unanimous), from Messrs. Armstrong. Margins of the segments violet, inner halves white with claret markings.

Other Exhibits.

Sir Jeremiah Colman, Bt. : new hybrids and *Dendrobium* flowers.

Mrs. Norman C. Cookson : hybrid *Odontoglossums* and *Odontiodas*.

Pantia Ralli, Esq. : *Odontoglossum crispum aureum*.

C. J. Lucas, Esq. : *Brassocattleya*.

Messrs. Flory & Black : *Odontoglossums*.

Messrs. Sander : *Odontoglossums* and scarlet *Odontiodas*.

R.H.S. EXAMINATIONS IN HORTICULTURE.

GENERAL EXAMINATION, 1919.

SENIORS.

ONE HUNDRED AND NINETEEN candidates presented themselves for the Senior General Examination. Of these sixteen, or fourteen per cent., were placed in the First Class; thirty-eight, or thirty-two per cent., were placed in the Second Class; forty-one, or thirty-four per cent., were placed in the Third Class; twenty-four failed to satisfy the Examiners.

The Examiners, Dr. A. B. Rendle, F.R.S., F.L.S., V.M.H., and Mr. James Hudson, V.M.H., report that the general standard of the answers was relatively much higher in the case of the Senior Candidates than in that of the Juniors, even after making due allowance for the difference in ages. Although there was a marked improvement in the direction of conciseness, there were cases in which the explicit instruction printed on the Question Paper was ignored. This only too frequently resulted in irrelevant and inadequate answers. For example, as an answer to the last question on "improvement by selection," which has been practised from time immemorial by gardeners, a detailed account of the discoveries of Mendel was not required; and those answers which were confined thereto were consequently far from adequate.

In many cases the Examiners were pleased to notice a good knowledge of experimental plant physiology. On the other hand, good line drawings were markedly absent; indeed, throughout the whole range of answers, a clear, well-executed line drawing was rarely found. In future years it is the intention of Examiners to expect neatly drawn, clear and accurate drawings to illustrate the answers given.

JUNIORS.

There were forty-seven candidates in the Junior Section. Of these six or thirteen per cent., obtained a First Class; twelve, or twenty-five per cent., obtained a Second Class; thirteen, or twenty-eight per cent., obtained a Third Class, and fifteen failed to satisfy the Examiners. One candidate did not present himself.

The Examiners report that there was evidence of very inadequate teaching at some centres. In Question 3, many candidates missed the point, viz., the loss of water by the leaves of the plant due to excessive transpiration; the answers were more frequently than not confused with direct loss from the soil by evaporation.

The necessity for good drawings in the Junior Section was also manifest; hardly any candidate was able to make a good drawing of a flower in vertical section.

April 1919.

W. WILKS, Secretary.

SENIORS.

Class I.

1. Johns, T. D., Cartref, Bryn Road, Tondy, nr. Bridgend.
2. { Cook, T. E., 6 Lawson Terrace, Newcastle, Staffs.
3. { Gibson, C. M., Home Mead, Frith Road, Newbury.
4. Jones, Miss K. L., Glyn-cerrig, Mumbles, S. Wales.
5. { Hazell, Miss M., Thatcham Fruit and Flower Farm, Newbury.
6. { Ormston, Miss E., Thatcham Fruit and Flower Farm, Newbury.
7. { Hird, R. W., 10 Roker Park Road South, Sunderland.
8. { Jameson, Miss E. W., Avondale, Rainsford Avenue, Chelmsford.
9. { Warburg, Miss W., Nantyderry Training Centre, nr. Abergavenny, Mon.
10. Pugh, Miss E. C., 21 Broadlands Road, Highgate, N.
11. Cole, W. E., Dyrham, Staple Hill, Bristol.
12. { Davis, Miss W. M., 17 Fawley Road, W. Hampstead, N.W.6.
13. { Surman, Miss N., Nantyderry Training Centre, nr. Abergavenny.

14. { Brockhouse, Miss D., Studley College, Warwickshire.
 { Rowe, R. J., Gretton, Church Stretton, Salop.
 { Youatt, Miss N., School of Gardening, Clapham, nr. Worthing, Sussex.

Class II.

1. { Hare, Miss K. C., Aldersey Hall, Horticultural College, nr. Chester.
 { Turner, Miss M., Brinkworth, Stapleton, Bristol.
 3. Tazewell, Miss K. M., St. James' Gardens, West Malvern, Worcs.
 4. Shaw, Miss A., Thatcham Fruit and Flower Farm, Newbury, Berks.
 5. { Campion, Miss P. M., Studley College, Studley, Warwickshire.
 { Ward, Miss I. W., University College, Reading.
 { Boyle, The Lady Helen, The Homestead, Meopham, Kent.
 { Hudson, C. E., 10 Fairfield Road, Chelmsford, Essex.
 7. { Macdonald, Miss J. Macleod, Aldersey Horticultural College, nr. Chester.
 { Procter, Miss C., St. Paul's Girls' School, Brook Green, Hammersmith.
 { Scholefield, Miss K., Horticultural College, Studley, Warwickshire.
 { Griffiths, R. P., St. Edmund's School, Crickhowell, S. Wales.
 12. { Heywood, Miss M. D. E., Thatcham Fruit and Flower Farm, Newbury, Berks.
 { Bentham, Miss M., 8 Thorn Road, Bournville, Birmingham.
 14. { Hilliard, Miss N., St. Gaten's School of Gardening, Rathfarnham, Co. Dublin.
 { Brockhouse, Miss K. E., Studley Horticultural College, Studley, Warwickshire.
 { Johnson, Miss I., Studley College, Studley, Warwickshire.
 16. { Nicolls, Miss E. C., 6 Summer Terrace, Onslow Gardens, S. Kensington.
 { Reilly, Miss D. K., Studley College, Studley, Warwickshire.
 { Stanley, Miss J., Culworth, Banbury.
 21. { Howells, J., Maeslan, Tonteg, Pontypridd, Glam.
 { Vale, Miss K. A., Thatcham Fruit and Flower Farm, nr. Newbury, Berks.
 23. { Gray, Miss E. W., Northgate Bungalow, Rottingdean, Sussex.
 { Peyton, Miss C. E., Studley College, Studley, Warwickshire.
 { Baker, F., 20 Cwmdare Street, Cathays, Cardiff.
 25. { Dickens, Miss A. M., Singlesole, Thorney, Peterborough.
 { Morris, Miss A. W., Thatcham Fruit and Flower Farm, Newbury, Berks.
 { Barton, Miss E. O., School of Gardening, Clapham, nr. Worthing.
 28. { Benest, Miss E. L., Thatcham Fruit and Flower Farm, Newbury, Berks.
 { Broadbent, Miss K. M., Huntsmoor Park, Iver, Bucks.
 { Hawkins, F., Chyreen, Rosemount Estate, Romford.
 { Hedger, B. J., The Gardens, Tredegar Park, Newport, Mon.
 32. { Pearson, A. J., R.H.S. Gardens, Wisley, Surrey.
 { Sharpe, Miss R. M., Huntsmoor Park, Iver, Bucks.
 { Chattaway, A., 54 Wellington Road, S. Ealing, W. 5.
 { Davies, Ray, Nantyderry Training Centre, Abergavenny, Mon.
 35. { Hill, Miss M. W., Balmavock, Perth, Scotland.
 { Rosencrantz, Miss V., Thatcham, Berkshire.

Class III.

1. { Amos, J., The Hollies, High Street, East Malling, Kent.
 { Butcher, Miss A. M., West Woodhay, Newbury, Berks.
 3. Batchelor, Miss M. W., Studley College, Studley, Warwickshire.
 { Clarke, Miss K. A., 72 Bridport Place, N. 1.
 { Davies, D., 5 Hill Street, Hendreforgan, Gylfach Goch.
 4. { Morgan, Miss B., Studley College, Studley, Warwickshire.
 { Witt, A. W., Broomfield, Offham Road, West Malling, Kent.
 8. Martin, Miss E. R., 14 Hartford Road, Davenham, nr. Northwich, Cheshire.
 { Chatterley, W. M., School House, Harvington, Evesham.
 { Cran, Miss L., Thatcham Fruit and Flower Farm, Thatcham.
 9. { Green, Miss D. K., Plas Newydd Gardens, Llanfair P.G., Anglesey.
 { Tucker, Miss L. G., 8 Fernleigh Road, Winchmore Hill, N. 21.
 { Vallance, F. H., Weston Park Gardens, nr. Stevenage, Herts.
 { Pearson, W. R., R.H.S. Gardens, Wisley, Ripley, Surrey.
 14. { Riddell, Miss I. C., 28 Kempeford Gardens, Earl's Court, S.W. 6.
 { Wagstaff, P. E., The Cottage, Bushey Hall Road, Bushey, Herts.

17. { Dagnall, Miss D., 48 King's Road, Willesden Green, N.W.
Mead, Miss A. A., Horticultural College, Studley, S.O., Warwickshire.
Smith, Miss M. H., Shelton Cottage, Chestnut Avenue, Oulton Broad,
Lowestoft.
Ratcliffe, Miss J., 24 Elizabeth Street, Nelson, Lancs.
21. { Campbell, Miss P., Priory Side, Tottenham, N. 17.
Jones, Miss G., Adam's Row, Scorrier, Cornwall.
Rushton, Miss V. M., Plas Newydd Gardens, Llanfair P.G., Anglesey.
24. { Brown, B. B., Avondale, Rainsford Avenue, Chelmsford.
Stuart-Menteth, Miss O., Studley College, Warwickshire.
26. { Bagnall, Miss E. A., 42 Harrington Street, Dublin.
Clark, Miss M. A., St. James' Gardens, West Malvern.
Hargreaves, J., The Gardens, The Whins, Sabden, nr. Blackburn.
Cruikshank, Miss H., Thatcham Fruit and Flower Farm, nr. Newbury.
FitzGerald, Miss M. O., St. Gatien's School of Gardening, Rathfarnham,
Co. Dublin.
29. { Gracie, Miss D. F., Studley College, Studley, Warwickshire.
Turrell, Miss M. A., Avondale, Rainsford Avenue, Chelmsford.
Adams, Miss D. P., Hillside, Barming, nr. Maidstone, Kent.
33. { Hallett, Miss J. E., 3 Logan Road, Bishopston, Bristol.
Dyke, Miss D. E. L., Eastfield, Flax Bourton, nr. Bristol,
Garnett, Rayne, 26 West Hill, Highgate, N. 6.
Gosselin, Miss E., 28 Aberdeen Road, Cotham, Bristol.
Otton, Miss J. M. H., 28 Old Fillebrook Road, Leytonstone, E. 11.
39. { Jensen, Miss D. H., Oaklands, East Farleigh, nr. Maidstone, Kent.
40. { Daniell, Miss A. C., 14 Downs Park West, nr. Bristol.
Moore, Miss E. A., Buckland Cop, nr. Betchworth, Surrey.

JUNIORS.

Class I.

1. Gill, Miss M., Aldersey Hall Horticultural College, Handley, nr. Chester.
2. Piper, E. W., The Lawns, Usk, Mon.
3. Nott, Miss E. M., 51 Apsley Road, Clifton, Bristol.
4. Paton, R. A., The Lawns, Usk, Mon.
5. Shearn, S. J., The Lawns, Usk, Mon.
6. Anderson, E. W., Bradwall Training School, Holmes Chapel, Cheshire.

Class II.

1. Stenning, R. W., Bradwall Training School, Holmes Chapel, Cheshire.
2. Houghton, A., Bradwall Training School, Holmes Chapel, Cheshire.
3. { Garrity, J., Bradwall Training School, Holmes Chapel, Cheshire.
Hyde, H., Bradwall Training School, Holmes Chapel, Cheshire.
5. { Thomas, H., Bradwall Training School, Holmes Chapel, Cheshire.
Thomas, W. S., Bradwall Training School, Holmes Chapel, Cheshire.
7. { McLoughlin, W., Bradwall Training School, Holmes Chapel, Cheshire.
Campbell, C., Bradwall Training School, Holmes Chapel, Cheshire.
8. { Jordan, E., Bradwall Training School, Holmes Chapel, Cheshire.
Ramsay, W. H. A., Bradwall Training School, Holmes Chapel, Cheshire.
11. Higginson, W., Bradwall Training School, Holmes Chapel, Cheshire.
12. Moseley, J. J., Bradwall Training School, Holmes Chapel, Cheshire.

Class III.

1. Redley, S. A., Bradwall Training School, Holmes Chapel, Cheshire.
2. { Ayer, G. S., Bradwall Training School, Holmes Chapel, Cheshire.
Sanders, H., Bradwall Training School, Holmes Chapel, Cheshire.
4. Simmonds, S., Bradwall Training School, Holmes Chapel, Cheshire.
5. Aldred, G., Bradwall Training School, Holmes Chapel, Cheshire.
6. Webster, F. W., Bradwall Training School, Holmes Chapel, Cheshire.
7. Singleton, W. H., Bradwall Training School, Holmes Chapel, Cheshire.
8. Welling, R., Bradwall Training School, Holmes Chapel, Cheshire.
9. Piper, G. F., The Lawns, Usk, Mon.
10. Downham, A., Bradwall Training School, Holmes Chapel, Cheshire.
11. Ratcliffe, N., Bradwall Training School, Holmes Chapel, Cheshire.
12. { Adam, D., Lostock Industrial School, Lostock Junction, Bolton, Lancs.
Cotterill, F., Industrial School, Lostock, Bolton.

TEACHERS' EXAMINATION IN SCHOOL AND COTTAGE
GARDENING.

HONOURS EXAMINATION.

APRIL 26 AND JUNE 27, 1919.

FIFTEEN candidates entered for the Teachers' Honours Examination. Of these eight satisfied the Examiners, whilst six failed, and one candidate did not present himself.

The examination comprised three parts—written, practical, and viva voce. The practical and viva voce examinations were held at the Society's Gardens at Wisley, Surrey.

The Examiners, Mr. F. J. Chittenden, F.L.S., V.M.H., Mr. C. R. Fielder, V.M.H., and Mr. C. W. Mayhew, report that in the practical part the best work was done on the ground, that with fruit was generally fair, but the indoor work was poor. The tests by which manures may readily be distinguished were not known, nor was the descriptive work good.

Candidates who have secured the certificate this year may next year take any other section than that in which they have passed, if they wish to do so. Passes in additional sections will be endorsed on the original certificate.

The Examination is divided into the following sections :

(a) General Horticulture as applicable to School and Cottage Gardens.

(b) Fruit-growing in the open.

(c) Vegetable-growing in the open, or with only the most simple protective aids.

(d) Diseases and pests.

The following candidates secured the "Honours" Certificate, namely :

Section A, General Horticulture.

Baker, W. H., 75 Mitchell Street, Clowne, Chesterfield.
Chatterley, W. Morley, School House, Harvington, Evesham.
Harris, James A., 9 Glasgow Street, St. James, Northants.
Rowe, R. J., Gretton, Church Stretton, Salop.
Sharman, H., 29 Sandringham Road, Northampton.
Squire, Miss E. A., Training College, Norwich.
Sterne, H. H., Hundon, Clare, Suffolk.

Section B. Fruit-growing in the Open.

Cole, W. E., Dyrham, Staple Hill, Bristol.

W. WILKS, *Secretary*.

PRELIMINARY EXAMINATION.

APRIL 26, 1919.

THREE hundred and sixty-two candidates entered for the Preliminary Examination held on April 26, 1919. Of these 14 obtained a first class, 84 a second, and 157 a third, leaving 78 failures, and 29 absentees.

The Examiners, Mr. F. J. Chittenden, F.L.S., V.M.H., Mr. E. R. Janes, Mr. C. R. Fielder, V.M.H., Mr. C. W. Mayhew, and Mr. C. Wakely, report that, except in Question 6, there were few really good answers. For the most part they were vague, and in many cases the Examiners were led to doubt the extent of a candidate's knowledge of practical horticulture. The following are some of the criticisms of the Examiners :

Speaking generally, candidates still disregard the wording of the questions.

A large number either failed entirely to understand the simpler facts of food-making, or, by means of simple experiments suitable for children of school age, to demonstrate the part that the green leaf plays in the making of the plant's food.

Many candidates confused the terms " tillage " and " tilth."

The methods of improving heavy land by ridging and draining, and the application of lime and littery manure, were generally understood, but many answers were of such length that candidates had not time to deal with light soils adequately.

It was remarkable how few of the candidates associated deep-working with the improvement of light soils, though the value of humus-forming material and surface cultivation in summer was appreciated. It was in respect to the chemical improvement of soils that the scantiest information was offered.

In reply to question 3, few candidates realized the danger of the spread of disease amongst overcrowded plants.

The difficulty of obtaining seeds from certain plants was not understood. Many fell into the common error of stating that " plants raised from cuttings are stronger and healthier than those raised from seeds."

A fairly good idea of the principles of cropping was shown, but the frequent appearance of a plan which had evidently been memorized from a text-book, rather than an original individually thought-out scheme, was disappointing. The principles of rotation were, on the whole, well understood, but their application to the plan was weak.

The " principles " of grafting were not understood. In question 9 there was a general lack of clearness as to the control of transpiration, and too much stress was laid on the use of chemical manures.

July 1, 1919.

W. WILKS, Secretary.

First Class.

1. Lomax, J. W., School House, Painscastle, Erwood, S.O., Brecons.
2. Davies, T. G., 1 Cross Street, Pontardulais, Glam.
3. Mitchell, Miss G., 1 North Road, Brightlingsea, Colchester.
4. Harris, M. O'Brien, 4 Graham Road, London, E. 8.
5. Athersmith, A. E., Casson Gardens, Ulverston, Lancs.
6. { Melhuish, R. W., 10 Alfred Street, Taunton, Som.
- Pugh, Miss E. C., 21 Broadlands Road, Highgate, London, N.6.
8. Jones, T. L., 33 Robert Road, Handsworth, Birmingham.
9. Whitling, R., Edenhurst, Beamish, co. Durham.
10. Ironside, R., The Schoolhouse, Madderty, Crieff, Perthshire.
11. { Cary, A. Trew, 21 The Avenue, Yeovil, Som.
- Griffin, M. J., St. Mary's Training College, Brook Green, Hammersmith, W.6.
13. Sanderson, J., 3 Prudhoe Villas, Alnwick, Northumberland.
14. Joyce, A. A., Ivy House, Garrigill, Alston, Cumberland.

Second Class.

1. Huck, E. E., 42 Crocker Street, Newport, Isle of Wight.
2. Kerwood, H. C., Newerne, Lydney, Glos.
3. Ayers, J., 12 Belle Vue Road, Sunderland, co. Durham.
- { Harris, A. E., 4 Albany Road, Falmouth, Cornwall.
- Houldsworth, G. E., "Ardrossan," Evesham Road, Stratford-on-Avon.
- Ogden, F., 6 Lansdowne Avenue, Leigh-on-Sea, Essex.
4. { Pendred, Miss R. I. M., Bradfield St. Clare, Bury St. Edmunds.
- Ripley, L. E., 14 Temple End, High Wycombe, Bucks.
- Underdown, Miss G. M., 24 Malton Street, Plumstead, S.E. 18.
- Bracwell, W. A., Westroyd, Little Holcombe, Ramsbottom, Lancs.
10. { Perkins, Miss M. E., 12 Norton Road, Letchworth, Herts.
- Thomas, D. H., School House, Shrawley, Worcs.
- Withers, Mrs. M. A., 128 Summergangs Road, Hull, Yorks.
14. Owen, D., 26 Bedw Road, Cilfynydd, Pontypridd.
- { Cartwright, B. S., 22 Sanctus Road, Stratford-on-Avon, Warwicks.
15. { Flanders, W. P., 102 Osbaldeston Road, Stamford Hill, N. 16.
- Herbert, T. E., 76 Schubert Road, Wandsworth, S.W. 15.
- Parry, W. R., West View, Bacup, Lancs.
19. Hobson, J. E., 325 Barnsley Road, Pitsmoor, Sheffield.
20. { Evans, Miss L. P., Blacklands School, Cavendish, Suffolk.
- King, Miss M., Bramley House, Ashcott, nr. Bridgwater, Som.
- Bell, Miss A. S., 2 South Esplanade, York.
22. { Jagger, Miss L. C., 22 Chapel Street, Queensbury, Bradford.
- Wiggins, W. A., 9 Park Road, Bedworth, nr. Nuneaton.
25. { Chattaway, A., 54 Wellington Road, South Ealing, W. 5.
- Randall, F. E., Lindonville, 398 Fulham Palace Road, S.W. 6.
- Beckett, Miss C. O., c/o Mrs. Paxton, 22 Swift Street, Barnsley, Yorks.
- Green, E. R., 8 Worbeck Road, Anerley, S.E. 20.
27. { Hanchet, Miss H. E., Brent Eleigh School, nr. Lavenham, Suffolk.
- Brooks, C. McColl, The Bungalow, Nether Stowey, Bridgwater, Som.
- Mather, J. H., Laurieston School, Falkirk, Stirlingshire.
32. { Clarke, Miss M. A., A.C.P., 28 Teddesley Street, Walsall.
- Stephenson, J. W., School House, East Hedley Hope, Tow Law, co. Durham.
- Glasson, A. L., School House, Long Wittenham, Abingdon, Berks.
34. { Nicholas, W. A., 24 Dorset Road, Forest Gate, E. 7.
- Oliver, W., Jubilee House, 6 Derby Street, Lincoln.
- Roberts, Arnold J., 67 Chesterfield Road, Bristol.
- Court, Miss P., 337 Romford Road, Forest Gate, E. 7.
- Crow, A., 19 Primrose Cres., Fulwell, Sunderland.
- Davis, E. G., 46 High Street, Lavenham, Suffolk.
38. { Daws, Holly, 600 Fishponds Road, Bristol.
- Jones, H. H., Shadow Moss School, Cheadle, Cheshire.
- Rixham, J., Ainderby Steeple, Northallerton, Yorks.
- Taylor, W. Y., 12 Carlton Terrace, Spennymoor, co. Durham.
- Hough, F., The Schoolhouse, Corpusty, Norwich.
45. { Nankivell, F. M., Chilsworthy, Gunnislake, Tavistock, Devon.
- Poulter, Miss I. D., 47 Lydhurst Avenue, Streatham Hill, S.W.

- Dewey, J. C., 44 Frensham Road, Southsea, Portsmouth.
 48. Kensett, Miss E. M., Post Office, Slaugham, Crawley, Sussex.
 Rhys, T. B., New Hedges School, Tenby, S. Wales.
 Wilkinson, G., Dellcroft, Westcliffe Road, N., Roker, Sunderland.
 52. Hopkins, E., 5 Cross Street, Pontardulais, Glam.
 Coe, Miss J. M., 24 Albert Street, Bury St. Edmunds.
 53. Foster, Miss E. M., 27 Windmill Hill, Enfield.
 Morgan, D. J., Penybont, Borth, Cardiganshire.
 Procter, Miss C., St. Paul's Girls' School, Brook Green, Hammersmith, W. 6.
 56. Williams, W. T., Blaenffos School, Pembro.
 Cowen, C. R., 3 Ellesmere Terrace, Roker, Sunderland.
 58. Packer, Miss L., School House, Black Bourton, Clonfield, Oxon.
 Pearce, W. G., 80 Broad Street, Chesham, Bucks.
 Chatters, W. A., School House, Rougham, nr. Bury St. Edmunds, Suffolk.
 61. Lawrence, H., 14 Edburton Avenue, Brighton.
 Tweddle, J., jun., School House, Willington, co. Durham.
 Bagnall, Miss E. A., 42 Harrington Street, Dublin.
 Hampshire, C. W., Parson Cross Road, Wadsley Bridge, Sheffield.
 64. Quattrough, J. P., Alexandra Road, Castletown, Isle of Man.
 Rævon, A., 120 Malvern Street, Stapenhill, Burton-on-Trent.
 68. Davies, D. T., jun., Derlwyn, Glynllwchr Road, Pontardulais.
 Britton, R., 10 Richmond Villas, Ilfracombe, Devon.
 Davies, W., 2 Watergate, Brecon, South Wales.
 Jones, W. P., The Meadows, Coed Talon, nr. Mold, North Wales.
 69. Kelly, W. E., The Schoolhouse, Andreas, Isle of Man.
 Knight, R. J., School House, Ditcheat, nr. Evercreech, Som.
 Prime, Miss K. E., Wingfield School, Harleston, Norfolk.
 Westlake, S. G., 2 West View, Fordton, Crediton, Devon.
 Finney, R. R., 2 Nut Street, Thatto Heath, St. Helens, Lancs.
 Jones, T., 21 Maesteg Road, Maesteg, Glam.
 76. Peake, F. S., 80 Tunstall Road, Biddulph, Congleton.
 Stowell, P. L., The Parade, Castletown, Isle of Man.
 Turner, J., Wesleyan School, Crawshawbooth, *via* Manchester.
 Wake, H. H., 1 Hilda Road, East Ham, E. 6.
 Jones, J. R., 32 Kensington Avenue, Manor Park, E. 12.
 82. King, J. T., Bramley House, Ashcott, nr. Bridgwater.
 Worthy, W. H., 1 Plym Villas, Plymstock, nr. Plymouth.

Third Class.

- Jones, W. J., 177 Upperthorpe, Sheffield.
 1. Harris, H. J., Swingfield School, nr. Dover.
 Law, Miss A. W., 7 St. Paul's Square, Holgate Road, York.
 Sheppard, Miss E., 4 Greenbank Villas, Burcot Road, Wells, Som.
 Allpress, A. K., 31 Holdenby Road, Crofton Park, S.E. 4.
 Brimson, Miss E., Banchory, Macdonald Avenue, Westcliff-on-Sea.
 5. Done, A., 139 Houghton Road, Hetton-le-Hole, Durham.
 Eyles, W. J., 117 Loyd Road, Northampton.
 Gwynne, D. B., School House, Llanrhian, Letterston, Pem.
 Short, A. B., St. Andrews, Westbury, Sherborne, Dorset.
 Hall, J. M., Kimblesworth Cl. School, co. Durham.
 11. Rigby, G. H., The School House, Dalham, nr. Newmarket, Suffolk.
 Bragg, A. T. W., 34 Finedon Road, Irthlingborough, Wellingborough.
 Cooke, Miss D. A., Girls' School, New Brancepeth, Durham.
 Jones, J. W., Brynawel, Croesgoch, Letterston, Pemb.
 13. Mountford, H. R., 123 Newtown Road, Bedworth, nr. Nuneaton.
 Rotherham, J., 8 Prospect Terrace, Neville's Cross, Durham.
 Williams, T., Glen Cottage, Darran Road, Mountain Ash.
 Woods, H. G., 17 Union Road, Above Hill, Lincoln.
 Hawkes, C. W., 9 Clarence Place, Kingsdown, Bristol.
 20. Furniss, Miss L., 531 Chatsworth Road, Chesterfield.
 Ward, G. D., 4 Wellington Terrace, Birnbeck Road, Weston-s.-Mare.
 Corfe, Miss M. E. E., 627 Seven Sisters Road, S. Tottenham, N. 15.
 Mallows, G. A., 33 Harpenden Road, Manor Park, E. 12.
 23. Marriott, J. H., 56 Glasgow Street, Northampton.
 Milne, H., School House, Sand Hutton, York.
 Sladen, C., Bardwell School, Bury St. Edmunds.
 Waterhouse, T. N., Newholme, 104 Church Road, New Mills, Stockport.

- Barrett, G. H., Hortonville, Millfield Lane, Hull Road, York.
 Brindley, C. W., Moorbrook, Bradwell, *via* Sheffield.
 Ellman, H. S., Oakhill Farm, Horsham, Sussex.
 29. Gell, Miss M. E., 73 Malew Street, Castletown, Isle of Man.
 Hesselgreaves, G. E., 40 Stansfield Road, Tadmorden.
 Rowlands, G. W., Brighton Villa, Clevedon, Som.
 Turland, M. G., 244 St. George's Road, Coventry.
 Wiggs, L. F. L., 84 James Lane, Leyton, E. 10.
 Boot, P. E., Pevensey, Watling Street, Bridgtown, Cannock, Staffs.
 Foizey, Mrs. M. R., 56 Adelaide Street, Crawshawbooth, nr. Manchester.
 Hall, Miss D. M., Roswyn, Swanscombe, Kent.
 Hammond, F. A. C., High Street, Ixworth, Bury St. Edmunds.
 37. Herring, V. R., 10 Lancaster Road, Bowes Park, N. 11.
 Taylor, Miss M. M., Long Compton, Shipston-on-Stour, Worcs.
 Smith, H., 6 Ladbroke Road, Bush Hill Park, Enfield, Middlesex.
 Wildgoose, Miss A. E. E., West View, Hollins Road, Macclesfield.
 45. Fearn, J., 45 Darracott Road, Bournemouth.
 Smales, Miss A., 78 Mitchell Street, Newtown, Wigan, Lancs.
 Davies, E. D., 8 Turle Mansions, Tollington Park, N. 4.
 47. Harries, W. J., Bryn Villa, Llanddarog, Carmarthen.
 Goldsack, Miss E. M., Highbury, Watlingbury, Maidstone, Kent.
 49. Last, Miss H. E., Wickham Skeith, Eye, Suffolk.
 Simpson, Miss C. A., 48 Amberley Road, Bush Hill Park, Enfield.
 Baty, T., 1 Oak Cottages, Enfield Road, Old Southgate, N. 14.
 Brooks, W. J. L., 38 Bostock Avenue, Northampton.
 Craze, L., Schoolhouse, Siddington, Cirencester, Glos.
 52. Duke, Miss E. W., School House, Cusop, Hay, Brecon.
 Inwood, Miss B., 37 Seymour Street, St. Johns, S.E. 8.
 Pearce, F., 8 Osborne Avenue, Ashley Down, Bristol.
 Robinson, J. E., School House, Tibay, Westmorland.
 Shaw, G. H., 7 Dryden Street, Westcott Street, Hull, Yorks.
 Davies, J., 100 Addlecroft, Scotforth, Lancaster.
 Dear, S., 22 Grosvenor Road, Heaton Moor, Stockport.
 60. Hughes, Miss M., 25 Cadbury Road, Moseley, Birmingham.
 Lloyd, A., Daventry, Bushbury Road, Fallings Park, Wolverhampton.
 Bott, Miss A. J., Brookside, Newark Road, N. Hykeham, Lincoln.
 Curry, Miss A. E., Beach Road, Dovercourt Bay, Essex.
 Dexter, W. E., 7 Broomwood Villas, The Bourne, Farnham, Surrey.
 Dolman, W. J., Church of England School, Buckingham.
 64. Peat, Miss D. M., 28 Effingham Road, Reigate, Surrey.
 Sainsbury, A., Walsworth, Albany Road, Salisbury.
 Salter, Wm. J., Brynteg, St. Stephen's Avenue, Pentre, Rhondda.
 Shenton, F. G., 31 Station Road, Meir, Stoke-on-Trent, Staffs.
 Tootell, Miss F., St. Juliot School House, Boscastle, Cornwall.
 Baker, Miss D. K., 37 Auckland Road, Tunbridge Wells, Kent.
 Hardy, C. E., Winston-on-Tees, Darlington.
 73. Oakley, Miss E. A., 9 Bell Street, Reigate.
 Webb, T. W., 25 Mansfield Road, Hasland, Chesterfield.
 Everingham, J. B., 26 Berkshire Road, Bishopston, Bristol.
 Mason, P. A., 204 Alcester Road, King's Heath, Birmingham.
 77. Rofe, A. J., 166 Sandhurst Road, Catford, S.E. 6.
 Scott, T. R., 42 Louise Street, Burslem, Stoke-on-Trent.
 Sheffield, L. W., 18 Wellington Road, Raunds, Wellingborough.
 Fleet, Miss D. E., 26 Eastwood Road, Goodmayes, Essex.
 82. Hampson, Miss A., 904 Park Lane, Brvn, Wigan.
 Neale, W. R., 54 Queen Street, Castlefields, Shrewsbury.
 Smith, Miss A. C., 6 Ladbroke Road, Bush Hill Park, Enfield, Middlesex.
 Dunk, Miss S. M., Awre Vicarage, Newnham, Glos.
 Ewing, W. P., 14 Brighton Avenue, Burnage Lane, Levenshulme, Man.
 Fuge, W. E., School House, Gillingham, Dorset.
 Harris, Miss A. F., 53 Wimbledon Park Road, S.W. 18.
 86. Leneham, J. C., 12 Union Street, Long Eaton, Notts.
 Littlewood, Miss E., Rookery, Bridgemont, Whaley Br., nr. Stockport.
 Lush, M., Cloncliffe, Winchester Hill, Romsey, Hants.
 Williams, A. J., c/o Mrs. Morgan, Rose Cottage, Eglwysilan Road, Abertridwr, Cardiff.
 Davies, D., 5 Hill Street, Hendreforgan, Gilfach Goch, nr. Bridgend.
 94. Norman, Mrs. A. B., Harton, Barton-le-Willows, York.
 Richens, F., 7 Brook Street, Woodbridge, Suffolk.
 Stonebridge, Miss L., East View, Burnt Oak, Edgware.

98. { Pinshing, Miss O., The Cottage, Hasketon, Woodbridge, Suffolk.
Quinn, Miss J., 11 The Avenue, Durham Road, Leadgate, co. Durham.
Southon, H. E., 153 Staines Road, Hounslow, Middlesex.
Atkinson, Miss M., 193 Longwood Road, Longwood, Huddersfield.
101. { Deeprose, C., 85 Milson Road, West Kensington Park, W. 14.
Dyer, H., 70 Headcorn Road, Thornton Heath, Surrey.
Stone, B., 17 Clarence Street, Egham, Surrey.
Bannister, A. J., 92 Venner Road, Sydenham, S.E. 26.
Harvey, A., 43 Fife Street, Crewton, Derby.
105. { Margaret, Sister Mary, St. Wilfrid's Convent, Cale St., Chelsea, S.W. 3.
Montgomery, W. J., Adfa, Newtown, North Wales.
Norris, H. S., 64 Norfolk Road, Erdington, nr. Birmingham.
Pyke, G. F., 2 West Villas, West Street, Newbury, Berks.
Fraser, Miss K., 20 Brackley Road, Heaton Chapel, nr. Stockport.
111. { Phillips, R. E., Chevithorne, Tiverton, North Devon.
Talbot, E. W., School House, Hingham, Attleboro, Norfolk.
Box, J. W., School House, Gt. Sankey, Warrington.
Owen, Miss I. L., 514 Stapleton Road, Eastville, Bristol.
Pickles, H., Gazeley, Newmarket.
114. { Pillar, Miss E. M., 118 Ramsden Road, Balham, S.W. 12.
Probert, Miss L., Little Nurseries, Hereford.
Roberts, E., Llys Trebor, Cefn Road, Old Colwyn.
Walker, R. J., 4 West View, Seaford, Sussex.
121. { Cricks, Miss M. A., 333 Wanstead Park Road, Ilford.
Hartland, D. H., 187 Turl's Hill Road, Hurst Hill, nr. Bilston.
Hulland, G. B., 18 Luke Street, Bampton, Devon.
Beard, W. H., Trafalgar House, Stanley Road, Ashford, Middlesex.
Beaton, J. L. R., Belville House, High Street, March, Cambs.
Clegg, H., 59 Anderson Road, Erdington, nr. Birmingham.
124. { Dale, Miss J. B., 3 Hopwood Gardens, Tunbridge Wells.
Hudson, W. L., 25 Glenwood Avenue, Westcliff-on-Sea, Essex.
Pringle, Mrs. E., 41 Howard Street, Sutton-in-Ashfield, Notts.
Stevenson, Miss E., 3 St. James' Avenue, Brightmet, Bolton.
Wildler, Miss B., School House, West Clandon, Guildford, Surrey.
132. { Chappell, W. H., 715 Washwood Heath Road, Birmingham.
Davies, Ll. M., 26 Ffordd Estyn, Garden Village, Wrexham, N. Wales.
Anstis, R., 26 Lewis Street, Great Bridge, Tipton, Staffs.
Barrett, R. L., The School House, Rawnsley, Hednesford, Staffs.
Cook, W., 285 Manchester Road, Blackrod, nr. Chorley, Lancs.
Cowen, T. E., Beech Cottage, Stoney Middleton, Sheffield.
134. { Hatton, E. W., Cot Lane, Kingswinford, nr. Dudley.
Johnson, D. L., St. David's C. School, Llandyssul, S.O., S. Wales.
Jutsum, T. W., Ifield School, near Crawley, Sussex.
Moore, F. W., Westbury House, Old Church Road, Clevedon, Som.
Olpin, G. M., The Cypresses, Foxmoor Lane, Ebley, Stroud, Glos.
Stubie, J. S., Grasmead, Hebron Road, Linthorpe, Middlesbrough.
Prior, Miss F. A., Roseheath, Swanley Village, Kent.
144. { Volrey, Miss F. G., Enderly, The Fields, Alsager, Stoke-on-Trent.
Whitworth, A., 56 Beaconsfield Street, Hvyson Green, Nottingham.
Bostock, T., Burton School, Neston, Chester.
Cullum, F. J., Kelsey Cottage, Patrick's Road, Dovercourt.
Edgar, Miss F., 1 Wensleydale Terrace, Gateshead.
Parry, G. H., 9 Rose Hill, Holywell, Flints.
147. { Rees, E. A., School House, Bucknall, nr. Lincoln.
Weaver, B., 20 Milton Road, Sneyd Green, Hanley, Stoke-on-Trent.
Wise, E. G., 38 Redcross Street, Grantham, Lincs.
Wisken, Miss B. E., Ivy Cottage, 14 Trinity Street, Bungay, Suffolk.
Clarke, F., Park View, Bath Road, Frome, Som.
155. { Evans, T. G., Bryn Awelon, Moorland Road, Bargoed, Glam.
Fowler, T. J., 14 Manor Square, Otley, Yorks.

ESTABLISHED
1804.INCORPORATED
1809.TELEGRAMS :
"HORTENSIA
SOWEST LONDON."TELEPHONE :
VICTORIA 5363.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W. 1.

NOTICES TO FELLOWS.

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| <ol style="list-style-type: none"> 1. Important Notices. 2. Subscriptions. 3. Form of Bequest. 4. New Fellows. 5. An Appeal. 6. The Society's Gardens at Wisley. 7. Students at Wisley. 8. Distribution of Surplus Plants. 9. National Diploma in Horticulture. 10. Examinations, 1920. 11. Information. | <ol style="list-style-type: none"> 12. Inspection of Fellows' Gardens. 13. Affiliation of Local Societies. 14. R.H.S. Gardeners' Diary. 15. Rules for Judging—1914 Code. 16. Food Production Publications.. 17. R.H.S. Pamphlets. 18. List of the Most Desirable Fruits. 19. Free Leaflets. 20. Book on Fruit Bottling. 21. R.H.S. War Relief Fund. 22. Garden Charts. |
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1. IMPORTANT NOTICES.

1. The Society's Hall in Vincent Square being now vacated by the Australian Imperial Force, the Fortnightly Meetings will be held in the Society's own Hall, in Vincent Square.

2. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year ; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription ; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the inconvenience of remembering their subscriptions, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of

payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W. 1."

3. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

4. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as, owing to the great increase in work which has fallen upon, or been voluntarily undertaken by, the Society, it is now more important than ever to fill the places of those who are taken from us. The annual revenue of the Society is nearly £10,000 less to day than it was five years ago, and if the work is to be carried on successfully it is most important that this loss should be made good without delay.

5. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows.

6. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till 6 P.M., except on Sundays, Good Friday, Christmas Day, and Meeting Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about 3½ miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; or motor cars can be had at Byfleet Station by applying to Mr. Howard, the Garage, Byfleet, Surrey. Accommodation and refreshments can be had at the Hut Hotel close to the Gardens, and also at the Hautboy, Ockham.

All communications to the Gardens should be addressed to "The Director" R.H.S. Gardens, Wisley, Ripley, Surrey.

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this at least £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to complete this sum?

7. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

8. DISTRIBUTION OF SURPLUS PLANTS.

Some years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive those surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows who had paid the current year's subscriptions the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to return their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows who have paid the current year's subscription can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the railways declining to deliver these parcels any longer, they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult before sending it in.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled. Plants cannot be sent to Fellows residing outside the United Kingdom.

No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

9. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National,"

lxii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The dates of the 1920 Examinations will be announced later. They will include practical, *viva voce*, and written parts; the practical part will be held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

10. EXAMINATIONS, 1920.

The revised syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 1½d.

11. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungus attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1.* Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

12. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz.: a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

13. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.

The list of benefits offered to Affiliated Societies has been revised and extended. It is hoped that all Societies will by Affiliation become united with the parent Society and through it with each other. Such a unity cannot fail to be attended with good and progressive results.

14. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1920 contains a considerable quantity of new information and is compiled more especially for the single-handed gardener. Fellows may obtain it from the R.H.S. Office, Vincent Square, London, S.W. 1; bound in imitation leather, 2s. over the counter, 2s. 3d. post free.

15. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 9d., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

* See R.H.S. Gardeners' Diary—"How to send Specimens for Identification."

16. R.H.S. PUBLICATIONS FOR THE ASSISTANCE OF COTTAGE AND ALLOTMENT GARDEN SOCIETIES.

To assist Allotment Holders and Cottage Gardeners the Society has published the following, to be obtained post-free from the Secretary at the price offered :—

	<i>s. d.</i>
Rules and Regulations for Allotment Societies	2
Rules for Judging Cottage and Allotment Gardens	2
*Companion Judges Sheet for ditto	3
Rules for Allotment and Vegetable Exhibitions	2
Vegetable Bottling and Fruit Preserving without Sugar, by Mr. and Mrs. Banks (including valuable recipes for Jams and Jellies)	1 8

Printed lectures, illustrated with lantern slides, have been prepared for the use of Societies of Allotment Holders. For particulars apply to the Secretary, R.H.S., Vincent Square, S.W. 1.

17. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They will be found eminently practical. The increase in the cost of paper and printing has necessitated revision of the price of these Pamphlets, which until further notice will be 6*d.* each, or by post 7*d.*

FOOD PAMPHLETS :—

- (e) Vegetables and How to Grow Them.
- (f) Vegetables from Seed sown in July and August.
- (g) The Cultivation and Manuring of the Garden.
- (r) Potatos in Gardens and Allotments.
- (w) Potato Growing—Spring work.
- (x) Potato Growing—Autumn work.
- (y) Potato Growing, Some Experiments in.
- (v) Cropping Allotments and Small Gardens.
- (a) List of Hardy Fruits, with Cultivation.
- (c) The Pruning of Fruit Trees.
- (b) The Training of Fruit Trees.
- (d) Keeping Fruit Trees Clean.
- (k) Fruit and Vegetable Bottling and Storing.
- (m) Vegetable Cookery.
- (n) Salads and Salad Making.

OTHER GARDEN PAMPHLETS :—

- (g) The Herbaceous Garden.
- (h) The Rose Garden.
- (i) Flowers for Small Gardens, Window Boxes, &c.
- (j) Hardy and Half-Hardy Annuals in the Open Air.
- (o) War-time Economy in Gardening.
- (p) Medicinal Plants and their Cultivation.
- (s) Fruit Cultivation under Glass.
- (t) The Pruning of Hardy Shrubs.
- (u) The Children's Garden.

18. THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE (Price 2*s.* post free).

Contains nearly 200 pages, and besides the list drawn up by the Committee gives lists of varieties recommended by nearly 100 expert growers all over the country for their respective parts of Great Britain. It shows the result of a ballot of varieties to be preferred for such characters as vigour of constitution, and for various purposes, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier; Pears—Bush, Standard, Espalier, Wall. It also shows the best varieties for cooking as distinct from dessert, the best for markets, and much similar detail of great value now that the desirability of planting more fruits is so widely recognized.

19. FREE LEAFLETS.

The following leaflets may be had free on receipt of a $\frac{1}{2}$ d. stamped addressed envelope; or at the rate of 2s. a hundred.

(1) Fruit Bottling for Cottagers; (2) Lady Carbery's Recipe for Preserving Fruits; (3) R.H.S. Dutch Brown Beans; (4) The Cultivation of Beans for Winter Consumption; (5) Butterfly Competitions.

20. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Mr. and Mrs. Vincent Banks, in whose lectures at the Fortnightly Meetings, on Fruit and Vegetable Bottling, Fellows have shown great interest, have now prepared a book on the subject, and the Council have published it. It contains the most up-to-date practical information on the subject. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of Fruit to be made into Jam later on, when sugar supplies are more abundant. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over many years. The 1918 revised edition, which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1s. 6d. over the counter, or post free 1s. 8d.; bound in stiff paper covers.

21. R.H.S. WAR RELIEF FUND.

The work of the Society having greatly increased since the outbreak of the War and the staff having greatly diminished, the Council found that the management of this Fund imposed a demand upon the staff which it was impossible to meet. A special Administrative Committee for the War Relief Fund was, therefore, appointed. The Committee is composed of Members of the Council, and of the Ladies' Executive Committee which has done such admirable work in collecting money for the Fund. The Office of the Fund is at 17 Victoria Street, Westminster, S.W. 1, where all communications and donations should be addressed.

22. GARDEN CHARTS.

The Society is preparing a series of large garden charts. The following are now ready, and can be had from the Society's Office, Vincent Square, Westminster, price 3s. 6d. each, viz. :—

INSECTS.—Chart (5) American Blight. (6) Magpie Moth. (8) Destructive Caterpillars. (13) Big Bud on Black Currant. (14) Mussel Scale. (15) Apple Saw-fly. (16) Lackey Moth.

FUNGUS PESTS.—Chart (1) Apple and Pear Scab. (3) Brown Rot. (8) Potato-tuber Diseases. (9) Silver Leaf.

DIGGING.—Chart (1) Double Digging.

VEGETABLE GROWING.—Chart (1) Preparing the Ground. (2) & (3) Seed Sowing. (4) Onion Growing. (5) Cabbage Planting. (6) Celery Growing. (7) Staking. (8) & (9) Potato Growing.

STORING.—Chart (1) Potato, &c., Clamping.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

MAY 13, 1919.

Mr. JOSEPH CHEAL, V.M.H., in the Chair.

Fellows elected (221).—T. B. Adams, E. E. Adamson, E. S. Allen, J. C. Allen, Miss F. Allen, Capt. D. Anderson, T. H. Anstruther-Gough-Calthorpe, F. B. Aris, His Worship Judge Atherley-Jones, T. A. C. Attwood, W. K. Balfour, R. Ballantine, Mrs. N. Barron, Miss E. Bashford, C. A. Bate, Mrs. L. J. Bateman, W. H. Beale, C. A. Benn, D. T. Bennett, Mrs. A. Bernard, H. J. Bidwell, L. S. Bielby, C. F. T. Blyth, G. E. Booker, R. V. Bowater, Lieut.-Colonel J. Brinton, B. Broadbent, Mrs. B. Brook, Hon. G. Bruce, S. Brunner, W. Bryant, Dowager Lady E. Mary Burrell, T. L. Burrows, R. F. Burton, W. R. Carles, A. K. Carlyon, A. T. Chamberlain, Lady W. Cheyne, J. B. Clark, W. Cobbett, G. Cochrane, W. Cocking, Mrs. M. A. Cohen, Lady C. A. Combe, R. Combe, J. Cooper, J. W. Coulthurst, B. Crawshay, Capt. Hon. J. A. Crichton, Capt. B. H. Croft, H. A. Cubitt, Col. E. C. Curre, Viscount St. Cyres, Muriel Viscount Deerhurst, Countess De la Warr, Miss Dell, Brig.-General A. C. Dick, F. W. Dillistone, Miss E. T. M. Drake, Miss Dugdale, T. G. Dugdale, Capt. J. T. Dunn, O. J. Dunn, J. E. Eastwood, Miss E. Ellston, H. Fairbank, Lady A. Fane, Lady Fanshawe, G. St. Clair Feilden, Mrs. Guy Fenwick, F. J. Fletcher, H. W. Foden, Mrs. D. M. Follett, A. R. Fordham, Mrs. L. C. Frampton, D. Fraser, Lady Galloway, V. Gammon, Lieut. H. Garden, Mrs. C. E. Gaze, H. V. Gibson-Craig, F. W. Gilbertson, J. Gilliat, Lady Gleichen, Major Hon. W. Gore, R. Grant, R. W. Granville-Smith, Mrs. T. Griffith, Miss C. W. Haig, J. B. R. Haine, Mrs. W. D. Halliburton, Sir H. Hamilton, J. G. Hamlin, J. C. Hanson, Sir C. R. Harrison, W. Hawkins, Hon. A. Henderson, Col. J. Hershall, Miss F. Hershall, Sir H. Hilliard, Miss N. Hilliard, W. S. Hodgkinson, Alec Holle, Sir H. Holloway, Lieut.-Colonel G. E. Holman, Mrs. A. K. Holman, Miss E. Holmes, Mrs. H. Hope-Nelson, Mrs. Horlock, R. H. Horlock, J. G. Howell, H. H. Hughes, H. W. Hurrell, Vice-Admiral J. D. Mestre Hutchison, Brig.-General P. O. Jefferies, S. Jobson, E. Johnson, E. M. Johnson, J. P. Jones, Miss L. Jones-Bateman, Miss E. Keep, Capt. C. M. King, A. W. W. King, Lady Nina Knowles, Lady Louisa Lawson, Mrs. Lee, J. H. Lowe, J. W. Lowther, Hon. Mrs. H. Lubbock, Col. A. G. Lucas, Miss A. K. Lucas, J. T. McCormack, Hon. Mrs. F. McLaren, Miss A. B. Maconachie, Mrs. E. Maitland, H. Markes, Sir E. Marshall-Hall, Miss E. Marshall-Hall, Mrs. A. V. Matson, Lieut.-General Sir Ivor Maxse, H. Middleworth, Miss H. Millard, W. E. Milne, Mrs. M. Moreton, Capt. C. Nester, W. Noakes, Miss E. Ormston, W. H. Owen, Mrs. J. Padgett, W. H. Pangbourne, A. J. Parish, T. Payne, E. T. Pearce, Dowager Countess of Pembroke, General W. C. Peppe, A. Perkins, Mrs. H. L. Perrett, T. Piper, Miss A. Pitt, H. A. Poels, A. E. Priestly, R. Pringle, Mrs. L. F. Purdon, Mrs. M. L. Quinion, Mrs. B. C. Ravenscroft, J. E. Rawlins, Lady Ree, H. Reeves, Lady E. L. Rogers, Rev. A. W. Rokeby, Mrs. Rolt, W. H. Routledge, E. G. Russell, Mrs. A. F. Russell, Mrs. M. L. Ryde, S. Sandle, Mrs. Sarel, W. S. Sarel, Mrs. Sedgwick, A. J. Shailer, Sir N. Shaw, Miss N. Shelley, Sir J. C. E. Shelley-Rolls, Mrs. G. B. Shields, G. T. Skilbeck, Mrs. D. Smeaton, C. H. Smeeton, Miss A. Smith, Major L. T. Spens, Rt. Hon. Sir A. Spicer, Capt. L. S. Stansfield, Major H. M. Stockdale, Miss F. A. Stuart, S. Summers, H. Sumner, Mrs. Swann, Mrs. M. K. Trimmer, L. O. Trivett, Mrs. E. H. Tubbs, H. Turner, Mrs. A. Turner-Bell, Col. L. T. Twyford, Mrs. L. T. Twyford, Mrs. A. H. Van de Heyat, Miss H. H. Vernon, Mrs. A. Villar, Lady Aline Vyvyan,

lxvi PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Hon. Mrs. B. Ward, J. E. Ward, R. B. Ward, Hon. Mrs. Warde, H. J. Warwick, Lady W. Waterlow, Mrs. C. M. Way, F. P. Wells, Mrs. H. G. Wells, Mrs. P. West, M. Williams, F. J. Wills, Capt. B. F. Wilson, J. Wood.

Fellows resident abroad (4).—J. Fleming, J. Mackenzie, R. E. Randall, R. G. Ray.

Associates (6).—Miss Barrand, Miss A. Chirgwin, Miss E. Colman, E. Cope, Miss B. G. Nicholson, Miss C. Mallandaine.

Affiliated Societies (1).—Kells and District Horticultural Society.

A lecture on "Bottling and Drying" was given by Mr. Vincent Banks.

GENERAL MEETING.

JUNE 17, 1919.

Mr. F. V. DARBISHIRE, M.A., Ph.D., in the Chair.

Fellows elected (10).—Mrs. W. Bennett, Mrs. B. G. Cowie, Mrs. J. M. Drew, G. Mawson, C. C. Morley, H. S. Rogge, S. F. Rotch, G. N. Smith, Mrs. J. W. Starkey, Lady Wilson.

A lecture on "The Care of the Plant" was given by Mr. H. E. Hodsoll.

MEETING AT CHELSEA.

MAY 20, 21, 22, 1919.

For other awards see Reports of Committees under this date.

MEDALS TO ORCHIDS.

Coronation Cup.

To Messrs. Armstrong & Brown, for group of Orchids.

Gold Medal.

To Messrs. Armstrong & Brown, for a group of Orchids.

To Messrs. Charlesworth, for a group of Orchids.

To Sir Jeremiah Colman, Bt., for a group of Orchids.

To Messrs. McBean, for a group of Orchids.

Silver-gilt Flora Medal.

To Messrs. James Cypher, for a group of Orchids.

To Messrs. Flory & Black, for a group of Orchids.

To Messrs. Stuart Low, for a group of Orchids.

To Messrs. Mansell & Hatcher, for a group of Orchids.

To Pantia Ralli, Esq., for a group of Orchids.

MEDALS TO EXHIBITS IN THE TENT.

Gold Medal.

To Messrs. Allwood, for Carnations.

To Messrs. Barr, for Tulips.

To Messrs. Carter & Co., for flowering plants.

To Messrs. Alex. Dickson & Son, for Sweet Peas.

To Messrs. Dobbie, for Sweet Peas.

To Messrs. Engelmann, for Carnations.

To Messrs. Ker, for Hippeastrums.

To Mr. R. C. Notcutt, for Brooms and flowering shrubs.

To Messrs. G. Paul, for Roses.

To Messrs. W. Paul, for Roses.

To Messrs. Sutton, for vegetables.

To the Hon. John Ward, for a collection of fruit.

To Messrs. Waterer, Son & Crisp, for Rhododendrons.

To Messrs. Webb, for flowering plants.

To Messrs. John Peed, for Caladiums.

Silver-gilt Flora Medal.

- To Messrs. R. H. Bath, for Tulips.
- To Messrs. Bees, for alpinas.
- To Messrs. Blackmore & Langdon, for Begonias.
- To Messrs. Ben Cant, for Roses.
- To Mr. R. H. Cuthbert, for Azaleas.
- To Messrs. Dobbie, for Tulips.
- To the Donard Nursery Co., for new and rare plants.
- To the Hon. Vicary Gibbs, for Pelargoniums.
- To Mr. Elisha Hicks, for Roses.
- To Messrs. Stuart Low, for Carnations.
- To E. J. P. Major, Esq., Rhododendrons species, and hybrid seedlings.
- To Mr. Amos Perry, for Alpines.
- To Mr. J. Stevenson, for Sweet Peas.
- To Messrs. Waterer, Son & Crisp, for herbaceous plants.

Silver-gilt Banksian Medal.

- To Mr. A. P. Brandt, for Crotons.
- To C. A. Cain, Esq., for Malmaisons.
- To Messrs. Cheal, for flowering trees and shrubs.
- To Messrs. Alex. Dickson, for Tulips.
- To Mr. Jas. Douglas, Border Carnations and Auriculas.
- To Messrs. Fletcher Bros., for Rhododendrons.
- To Messrs. Hogg & Robertson, for Tulips.
- To Messrs. B. Ladhams, for herbaceous and hardy plants.
- To Mr. G. W. Miller, for herbaceous.
- To Mr. R. L. Mond, for Calceolarias.
- To Mr. Maurice Prichard, for herbaceous and alpinas.
- To Mr. L. R. Russell, for stove plants.
- To Messrs. Sutton, for Tulips.
- To Mr. Chas. Turner, for Lilacs.
- To Messrs. R. Wallace, for Tulips and bulbous plants.
- To the Yokohama Nursery Co., for Japanese trees and miniature gardens.

Silver Flora Medal.

- To Mr. J. C. Allgrove, for flowering plants.
- To Messrs. Bakers, for herbaceous and alpinas.
- To Messrs. Barr, for Irises.
- To Messrs. Cannell, for hardy plants.
- To Messrs. Cutbush, for alpinas.
- To Mr. Alfred Dawkins, for Schizanthus and Calceolarias.
- To Mrs. Lloyd Edwards, for Saxifrages.
- To Messrs. Hobbies, for Roses.
- To Messrs. Stuart Low, for Australian greenhouse plants.
- To Messrs. J. Piper, for Chinese plants.
- To Messrs. J. Piper, for alpinas.
- To Mr. R. Prichard, for alpinas.
- To Mr. G. Reuthe, for flowering shrubs.
- To the Hon. John Ward, for Carnations.

Silver Banksian Medal.

- To Messrs. Allwood Bros., for Dianthus Alwoodii.
- To Messrs. Cheal, for herbaceous plants.
- To Messrs. Cutbush, for Roses.
- To Messrs. Cutbush, for Carnations.
- To Mr. C. H. Herbert, for Pinks.
- To Messrs. Jarman, for Pelargoniums and Stocks.
- To Messrs. Kent & Brydon, for alpine plants.
- To Messrs. Luxford, for Carnations.
- To Mr. G. W. Miller, for rock plants.
- To Mr. Chas. Turner, for Roses.
- To Messrs. Reamsbottom, for Anemones.
- To Messrs. Rogers, for alpine plants.
- To Messrs. Waterer, Son & Crisp, for alpine plants.
- To Mr. Geo. Prince, for Roses.

lxviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Bronze Banksian Medal.

- To Messrs. Cheal, for alpine plants.
- To Messrs. H. B. May, for flowering plants.
- To Messrs. Waterer, Son & Crisp, for Tulips.
- To Messrs. G. G. Whitelegg, for alpine plants.

SCIENTIFIC EXHIBITS.

Gold Medal.

- To R. Butterfield, Esq., for exhibit of British Galls.
- To Mr. J. K. Ramsbottom, for exhibits of Eelworm Investigation.
- To Nature Study Union for Nature Studies.

EXHIBITS IN THE OPEN AIR.

Daily Graphic Cup.

- To Messrs. R. Wallace, for rock garden.

Gold Medal.

- To Messrs. Fromow, for Japanese maples.
- To Messrs. Herbert Jones, for formal gardens.
- To Messrs. R. Tucker, for rock garden.
- To Messrs. Pulham, for formal garden.
- To Messrs. R. Wallace, for rock garden.
- To Messrs. J. Wood, for rock garden.

Silver-gilt Flora Medal.

- To Messrs. Elliott & Clarence, for rock garden.
- To Mr. L. R. Russell, for flowering and ornamental shrubs.
- To Messrs. Waterer, Son & Crisp, for ornamental trees and shrubs and Topiary work.

Silver-gilt Banksian Medal.

- To Messrs. John Klinkert, for Topiary work.
- To Messrs. J. Piper, for formal garden and Topiary work.
- To Messrs. Pulham, for rock garden.

Silver Flora Medal.

- To Messrs. G. G. Whitelegg, for rock garden.
- To Mr. E. Dixon, for formal garden.

Silver Banksian Medal.

- To Mrs. Hopkinson, for rock garden.

Bronze Banksian Medal.

- To Messrs. Herbert Brook, for formal garden.
- To Messrs. James Macdonald, for grasses.

For the first time the meeting included a series of exhibits illustrating the results of investigations being carried out at the Society's Experimental Garden at Wisley, together with photographs illustrating the new Laboratory both inside and out, an extensive series of cases illustrating the life histories of pests of garden plants made for the Society by Mr. Bastin, of Reading, and used in the Society's Food Production Campaign, several charts published by the Society for use in schools, and a series of preparations showing galls occurring on British plants, as well as an extensive set of objects further referred to below, collected together and exhibited by the School Nature Study Union.

On each afternoon a lecture or conference took place, and all were well attended.

Tuesday.—"Horticultural Education and Research." By Dr. F. Keeble, C.B.E., F.R.S.

Wednesday.—"Conference on Fruit Growing" (see p. 60).

Thursday.—"The Plants Exhibited." By Dr. A. B. Rendle, M.A., F.R.S.

The chief exhibits from Wisley comprised a series of nozzles used in spraying for different purposes, together with diagrams illustrating the nature of the spray delivered and the area covered by the liquid from different nozzles under the same pressure. Various types of spraying machines and different kinds of spraying materials were also exhibited, and in connexion with the series a demonstration was given every day by Mr. G. F. Wilson, attached to the Entomological Staff at Wisley.

A second series of exhibits showed the relative yields of a number of varieties of beans which may be dried and used as "haricots" during winter, together with tables and models by Dr. F. V. Darbishire, of the Chemical Department, illustrating their food value in comparison with potatoes and other crops, which charts showed the actual amount of food that may be obtained from a given area of ground under these crops.

A large chart also illustrated the yield to be obtained from potatoes planted at different distances apart, together with the comparative quantities of "chats" and "ware" produced in each case and the quantity of "seed" planted.

A series of preserved specimens and photographs represented the results of the investigation carried out by Mr. J. K. Ramsbottom into the causes and prevention of what is now known as the Eelworm disease of Narcissi, and demonstrating the efficacy of the warm bath treatment of the bulbs in preventing the disease. Accounts of much of this investigation have already appeared in our JOURNAL.

SCHOOL NATURE STUDY UNION EXHIBIT.

By invitation the School Nature Study Union, which aims at bringing together for mutual help and advice those interested in Nature Study in general and its place in education in particular, prepared an educational exhibit.

The exhibits covered a wide field, and were the work of individuals, adults, of groups of students in training, or of school children.

A collection of Lichens was shown by Mr. R. Paulson, F.R.M.S., F.L.S. The exhibit, Lichens in "Nature's Colour Scheme," was arranged for the purpose of showing to what a large extent the surface coloration on rocks, soil, and tree trunks is due to lichen growth. Each section of the exhibit indicated the great range of colour that exists among these plants. Included among the lichens selected were several, mostly representatives of the genus *Placidium*, which were either orange-red, orange-yellow, citron-yellow, green, or blue-grey in colour.

Specimens of the "Wandering Lichen," *Parmelia revoluta* var., were also shown. This plant has frequently no attachment whatever, and is blown about over short grass; and yet the only locality in which it is now known to exist is in a small area on the Sussex Downs.

Wild Flowers grouped according to habitat were shown by Miss E. C. Pugh, the flora associated with oakwoods on clay, moorland, chalk downs, bog, and marsh land being represented. Fine specimens of *Orchis purpurea* (Hudson) from beech woods on chalk, *Saxifraga umbrosa* from an Irish bog, and *Euphorbia Cyprariissias* from rough fields in Hampshire were the plants of greatest botanical interest.

Trees and Shrubs flowering in May were exhibited by the students of the School of Nature Study and Gardening, Clapham, Sussex, and by Miss Hill. Harrow. Students' drawings illustrating the unfolding of tree buds and flower structure and development accompanied the living specimens. Of deciduous trees, *Cercis Siliquastrum* and *Fraxinus ornatus* were of interest, and many beautiful evergreens in flower. Photographs of plant associations, chalk scenery and flora, of Oxshot Common and its flora, of fungi, trees, and other subjects were shown by Mr. Mollet, Secretary of the Photographic Section of the Union.

Several exhibits dealing with insect study were displayed.

A representative collection of the British Social Wasps (Vespidae) was shown by Mr. C. Nicholson, F.E.S., with specimens of nests of most of the species, and a statement drawing attention to the uses of wasps in destroying large numbers of caterpillars and other annoying insects; also a small case containing examples of insects, other than wasps, which either habitually live, or have been found, in their nests—these including parasites, scavengers, and casual lodgers, each class appropriately indicated—and of insects which resemble wasps in colour and pattern, so deriving protective benefit by their resemblance to creatures so well known to be dangerous and therefore generally avoided by birds and other animals. The insects in this box comprised Coleoptera (beetles), Diptera (two-winged flies), Hymenoptera (ichneumon flies, saw-flies, and ruby-tailed flies), and Lepidoptera (moths).

He also exhibited a box of specimens of the two Narcissus flies, *Merodon equestris* and *Eumerus strigatus*, showing the principal varieties of the former, and a 'nest' of caterpillars of the Lackey Moth (*Malacosoma neustria*) feeding on plum, with examples of the egg-ring, pupa, cocoon and moths, and an explanatory label.

A collection of insects, centipedes, etc., was sent from the School of Nature Study and Gardening, Clapham, Sussex, the specimens having been found and studied in relation to the gardening course undertaken there. The students' Insect note books were also shown. Specimens of the Burying Beetle (*Necrophorus mortuorum*), the Devil's Coach Horse (*Ocyopus olens*), the Lacewing Fly (*Chrysopa vulgaris*), Ichneumons, and several larvæ of Ground Beetles (*Carabidae*) were amongst those of use from the horticultural point of view, while the Leather Jacket (the larva of *Tipula*), wire-worms (the larvæ of the Click-beetle), the larva of the Common Cockchafer (*Melolontha vulgaris*), the Mottled Umber Moth (*Hybernia defoliaria*), the Cabbage White (*Pieris brassicae*) and the Ermine Moth represented those insects whose activities are distinctly harmful. There was also a complete life history of the Gooseberry Saw-fly.

Subterraria for observing the transformations of insects underground were exhibited by Mr. Hugh Main, F.E.S. The largest of these contained two full-fed larvæ of the Dor or Watchman Beetle (*Geotrupes stercorarius*) in their cells awaiting pupation. Two similar cages showed larvæ of the Devil's Coach Horse (*Ocyopus olens*) and Burying Beetles (*Necrophorus ruspator*).

Lantern slides, made from the exhibitor's photographs, were also shown illustrating the life history of *Dyticus marginalis*, the Cabbage White Butterfly (*Pieris brassicae*) and its parasites, of aphid feeders, such as the Ladybird (*Coccinella*), Lacewing Fly (*Chrysopa*), and Hover Fly (*Syrphus*).

Aquaria for observing the habits and transformations of aquatic insects were shown by Mr. Withycombe. They contained a variety of insects, water beetles (*Acilius* and *Dyticus*), Pond Skaters (*Gerris*), Water Boatmen (*Notonecta* and *Corixa*); the interest of the aquaria being enhanced by beautiful specimens of aquatic plants of which frog-bit (*Hydrocharis morsus-ranae*), hornwort (*Ceratophyllum demersum*), bladderwort (*Utricularia neglecta*) and Nitella (in fruit) may be mentioned.

Some eighty bird-skins, exhibited by Miss Hibbert-Ware, F.L.S., together with, in many cases, the actual contents of the crop or gizzard at the time of death, gave first-hand evidence as to the nature of the food of such birds as are of doubtful, or of bad, repute in the opinion of the gardener and gamekeeper. Nine dor beetles, for instance, were seen to have constituted the last meal of the Little Owl, whilst the Barn Owl had devoured "vermin" in the form of mice and beetles. It was shown that the Woodpecker, Peewit, Kestrel, and Titmice are among the best friends of the agriculturist, and that the thrushes do far more good than harm.

Starlings and Rooks become harmful only when allowed to become too numerous. The only really bad records are those of the Jay, Wood Pigeon, and Bullfinch. It was carefully explained that no bird had been killed for the purpose of the collection, also that the exhibitor gave practical evidence only, and in no case decided whether a bird was beneficial or injurious without the actual examination of its food contents.

There were exhibits bearing directly upon gardening, viz.:—

A series of experiments with soil, set up by Mr. Craig (South Hackney Central School), showing how the fundamental principles governing gardening practice can be simply demonstrated, the experiments involving the use of only the simplest apparatus, and suited to the capacity of quite elementary pupils.

St. Hubert's School for Mentally Defective Elder Boys, in which gardening together with other practical subjects plays an important part, exhibited apparatus in cardboard, wood, metal, and leather, all made in direct response to the need of the garden and the workers.—Exhibitor, Mr. Snook, F.R.H.S.

Material illustrating the field work done in Geology, Botany, and Nature Study on School Journeys was exhibited by Mr. G. G. Lewis of Ellerslie Road School. Specimen pages from the guide books prepared for such journeys, photographs showing school children at work in the country and on the sea-shore, and samples of their work were displayed.

Nature Study Leaflets and "School Nature Study," the Journal published by the Union, were on view.

GENERAL MEETING.

MAY 27, 1919.

Rev. JOSEPH JACOB in the Chair.

Fellows elected (217).—G. S. Albright, Miss C. M. Alexander, Mrs. R. G. Alford, Mrs. R. Allen, Mrs. S. Austin, Lord Avebury, Capt. R. Backhouse,

Mrs. W. G. Baird, Sir W. F. Barrett, Lady Barry, Mrs. H. Bayley, R. Bayley, Lord Belper, P. Blenkinsop, Miss M. Blount, F. Boddington, Sir Jesse Boot, Lady Boot, Miss M. Bowden-Smith, A. Brame, Mrs. J. H. Bridges, N. B. W. Bromley, F. F. Brown, Mrs. Bullivant, H. G. Bunting, A. E. Butler, Mrs. M. E. P. Butt, Sir T. O. Callender, Hon. Mrs. J. Campbell, Dr. C. W. Campbell, Mrs. E. Cape, Miss Cawthra, J. Charrington, Major H. Chawner, Mrs. W. L. Ching, Miss C. L. Churchill, Mrs. S. C. Clapham, J. L. Cloudsley, Col. Lord D. Compton, Lady D. Compton, Mrs. E. M. Conant, Dr. Peter Cooper, Col. E. W. Craddock, L. Cresswell, M. E. Crocker, Mrs. Croft, F. W. Crossman, A. E. Culison, R. Cumber, H. A. F. Daire, Sir S. Dannreuther, C. P. J. Darby, B. Davis, Miss I. Dilworth, W. T. Douglas, Miss I. Drysdale, Miss W. B. Duckworth, Mrs. E. N. Dumas, Miss Duncan, Earl of Dunmore, Mrs. Elliott, Mrs. E. Engall, W. Evans, Vice-Admiral Sir H. Evan-Thomas, Brig.-General J. T. Evatt, Marquis of Exeter, Miss M. M. Fitz-Roy, Capt. N. Flower, B. C. Forder, Miss K. E. Fuller, Miss H. Fullerton, L. Gilan, T. H. Glassborow, Miss C. E. Godman, Miss E. M. Godman, W. V. Goodwin, Rear-Admiral A. Grant, Mrs. W. Grazebrook, S. H. Gregg, Mrs. F. Green, Mrs. D. F. Greer, Mrs. A. Guthrie, Miss J. Hadden, C. I. Haden, Lady Hain, A. E. Haines, Lieut. T. W. Harding, Miss M. Harvey, P. Haughton, A. E. Hawley, Miss M. Hazel, R. Hebblethwaite, Mrs. S. Henderson, W. Hewitt, C. H. Hill, Mrs. A. E. Hind, Lieut.-Colonel C. H. Hoare, H. Hoey, Rte. Hon. J. Hogg, Mrs. E. K. Holdstock, W. Holloway, Major W. Houldsworth, Mrs. H. M. Hughes, J. H. Humphries, Marquis of Huntly, E. Jukes, Capt. F. Keith-Jones, Jas. Kelway, Sir G. H. Kenrick, F. Ker, A. Kingham, M. Knight, G. Knowles, J. B. Lakin, Hon. Mrs. C. Lambton, Hon. Maude Laurence, Miss H. Laurence, Miss E. K. Leeson, F. G. Lelen, Miss M. M. Leonard, Mrs. H. Letts, Hon. W. H. Lever, Earl of Listowel, Mrs. E. M. Littlewood, A. Longden, Sir R. P. Lyle, Miss M. S. Macfie, Miss D. McLean, Mrs. J. Marcel, Hon. Mrs. S. Marsham, Mrs. J. L. Matheson, Hon. Mrs. B. Maxwell, R. G. May, A. A. Mead, Miss J. McAd, H. Measures, Miss L. M. Medlycott, G. W. Meekings, T. Middlemore, Mrs. J. Moorhouse, R. Neal, W. Nisbet, Marquis of Northampton, Mrs. W. Parish, W. F. Parker, Hon. Mrs. Partington, Miss J. L. Peel, T. M. Penton, B. Peyman, Lady Pink, Brig.-General T. Pitt, His Majesty King Manoel of Portugal, Her Majesty Queen Augusta of Portugal, A. H. Pott, Lieut.-Colonel Price-Davies, A. Raab, Mrs. E. Rice, T. P. Rider, C. E. Ridley, A. F. Rimmer, Mrs. G. S. Robertson, W. Robertson, S. T. Rosbotham, Miss L. Rose, Miss M. Rowe, Mrs. A. Rowntree, Rev. H. C. Russell, S. G. Sackville, F. Samuelson, Sir E. S. Scott, F. A. Secrett, A. H. Shelton, Hon. Mrs. B. Sidebottom, Miss Skevington, Capt. Sir John Smiley, Miss B. Smith, W. Smith, Capt. L. C. Somervell, W. S. Southwell, A. F. Sotheby, W. Stevenson, Brig.-General W. Strong, Mrs. F. Summers, Miss M. Symonds, R. J. Tabor, Sir A. J. Tedder, E. S. Theobald, Mrs. E. M. Thompson, Col. Thomson, Mrs. Thomson, Mrs. A. Topham, E. C. Trench, Mrs. B. Trinder, Miss M. Tuke, H. F. Vandermin, H. W. K. Wait, J. A. Wallace, H. Walmesley-Cotham, J. R. Walton, W. G. Ward, E. H. Warner, H. Wellby, Miss E. O. Western, Mrs. W. Weston, H. Whalley, J. Whitall, Mrs. H. Willans, Capt. A. Wills, A. B. Winch, Lady Dorothy Wood, Lieut.-Colonel P. Wood, G. E. Wood, R. C. Wood, G. R. Woodward, Mrs. A. R. Woodward, R. H. Wyatt.

Fellows resident abroad (3).—A. Gauthier, H. Helbawy, J. Louhal.

Associates (6).—D. Barnard, H. C. Bolingbroke, Miss Hill, G. M. Luis, J. A. Parker, Miss S. Whitfield.

Affiliated Societies (5).—Ashton in Makerfield Garden and Allotment Association, Berkhamsted Chrysanthemum Society, Cranleigh Horticultural Society, Heighington Horticultural Society, Stockport Small Holdings Allotment Association.

A lecture on "Some Irish Gardens" was given by Mr. J. G. Weston (see p. 247).

GENERAL MEETING.

JULY 1, 1919.

Mr. A. W. SUTTON, F.L.S., V.M.H., in the Chair.

Fellows elected (167).—Dr. Marian Archibald, Rev. Canon H. Arnold, Lady Violet Astor, E. Atkins, A. S. Bailey, S. H. Bailey, Miss M. P. Baker, T. Baker, T. St. J. Bashford, H. W. Baxter, D. T. Bennett, Miss S. Bishop, Major J. W. Brand, E. H. Briault, Miss J. Brooks, Rev. T. Browne, E. Budd, Miss E. Call-

well, Mrs. E. C. Castleman-Smith, Mrs. L. Cattley, Commander F. W. Chaine, N. Chamberlain, Miss M. F. Chisnall, Sir W. H. Christie, Lady Beatrice Kerr Clark, J. Clayton, H. M. Collinson, W. A. Collier, W. H. Cooke, J. Cookson, Mrs. Copperthwaite, Capt. F. M. Coventry, F. D. Crew, J. N. Cross, Mrs. C. Crowe, Miss R. Crump, J. H. Davidson, R. H. Dennis, Lord Dewar, H. W. Dixon, Mrs. M. B. Donahue, L. W. Donald, Mrs. V. Dormer, F. W. Duffield, T. Durbridge, A. Edwards, C. Emerson, W. Esdaile, A. E. Fassnidge, A. C. Fincken, Mrs. G. Fisher, Major A. B. Fox, Mrs. B. Furze, Mrs. H. M. Gamble, Miss H. Gilbey, R. Giles, Lord Dudley Gordon, Mrs. R. B. Graham, Marchioness of Granby, Mrs. P. A. Hankey, Miss A. R. Hanson, Mrs. M. Hare, Mrs. F. E. Harrison, G. Hatton, Marquis of Headfort, A. W. Hickling, John Hill, C. A. Hodge, Mrs. E. M. Hodson, A. M. P. Hodsoll, A. T. Holman, H. Horsnaill, E. E. Huck, F. H. Hudson, R. Hulme, Miss R. Hunter-Muskett, A. C. Ireland, J. H. Jacobs, A. Jagger, J. Jarvis, C. Jones, E. H. Jones, E. C. Judkins, R. H. Keller, Mrs. F. B. Kempe, Miss Lambton, Mrs. W. T. Lawrence, Miss E. Leader, Brig.-Gen. D. A. Legard, Lieut. E. B. Lindell, G. Lloyd, F. Longly, S. Machin, Mrs. H. MacIntyre, E. M. Magor, Miss M. R. Mann, S. J. Mansfield, H. Marcham, A. T. Marks, J. W. Marsden, Mrs. C. Marshall, Mrs. Martin, H. E. Mason, W. P. Matthews, Mrs. A. H. Melchers, C. P. Milton, G. P. Morrish, Mrs. A. R. Musgrave, Mrs. W. Neville, Miss C. Newton, Lady R. Nicol, Miss L. M. Oliver, Miss F. Parke, Lieut.-Col. F. E. Parkinson, Lieut.-Col. P. W. Parkinson, Mrs. J. Paterson, Hon. Mrs. C. Pearson, Hon. Lady Peek, Mrs. Grant Peterkin, E. H. Phillips, J. O. Phillips, Miss A. M. Powell, Edgar Pulbrook, E. R. Pulbrook, Mrs. H. Ramsden, A. V. Reed, Miss D. K. Reilly, R. F. A. Reisco, Miss K. R. Rhodes, Mrs. W. F. Rigden, J. J. Rinck, Countess of Rosse, Mrs. G. E. Sadler, Lieut.-Col. J. A. Scarlett, W. A. Shaw, C. R. Shield, Mrs. D. Spicer, Mrs. E. C. Sprawson, Mrs. R. A. Stainer, Mrs. R. H. F. Standen, S. O. Stephenson, Miss F. M. Sterling, Mrs. J. Stewart, F. C. Stoner, Mrs. E. Storey, Mrs. J. Sugden, Mrs. Swift, Mrs. Tallents, R. Taylor, E. H. Thompson, E. L. Thorne, T. C. Thornicraft, Mrs. M. L. Tinker, Miss E. Tucker, Mrs. H. J. Turner, C. Wallis, C. H. Walter, C. H. Ward, A. Wedgwood, D. H. Welch, W. H. White, J. R. Williams, A. Willis, Lady F. Willoughby, Dr. Mary Wilson, A. B. Wilson, C. Wyatt.

Fellows resident abroad (5).—Mrs. R. J. Flanders, A. Harris, P. C. Holden, J. Lewis, S. C. Roy.

Associates (2).—A. Cox, N. R. W. Thomas.

Affiliated Societies (5).—Cymmer Port Talbot Allotment Society, Grimsby Dist. Allot. Holders' Assn., Hurstpierpoint Horticultural Food Production, Kidderminster and Dist. Hort. Assn., Wilnecote Hort. Society.

GENERAL MEETING.

JULY 15, 1919.

Mr. W. HALES, A.L.S., in the Chair.

Fellows elected (65).—Mrs. Ackroyd, A. Amery, Miss A. M. Baird, W. A. Baird, H. C. Bayer, Miss C. G. Bell, S. W. Bishop, Miss M. G. Bolton, E. D. Busby, Rev. H. L. de Candole, Mrs. H. L. de Candole, J. E. Cardigan-Williams, B. S. Cartwright, Mrs. Charlton, A. Chattaway, A. F. Clark, Mrs. G. L. Constant, W. J. Dallow, W. E. Dexter, A. Dicken, Mrs. Fullerton, H. Gamble, Mrs. M. E. Geldard, Lady M. Glyn-Jones, F. Godlee, D. B. Gwynne, Miss L. Hamilton, Lady Horsburgh-Porter, J. B. Hotham, Mrs. R. L. Howe, J. A. Jeffery, J. W. Jones, James Keress, Miss E. Kirk, Major J. W. Leather, J. W. Little, Brig.-Gen. S. Lushington, S. Martineau, Miss Maxwell, Mrs. G. Mills, H. W. Morris, H. J. Mousley, Major H. Parker, W. Pritchett, H. Rayment, Mrs. J. F. Riddell, S. F. Russell, Major G. O. Sandy, A. A. Searl, M. W. Slade, Hon. Mrs. T. C. Smith, H. Spence, Mrs. J. C. Stevenson, W. M. Strachan, A. D. Sweeting, E. F. Thorne, Mrs. M. A. Trewent, C. B. Ussher, J. B. Walker, Miss E. Watt, Mrs. A. Waymouth, S. L. Wells, T. R. Whitley, E. G. Wise, Mrs. C. Wray.

Fellows resident abroad (2).—H. J. Bedford, Miss E. S. Harrold.

Affiliated Societies (1).—Mid-Cheshire Farmers' Association.

A lecture on "National Afforestation" by Mr. A. D. Webster was read (see p. 278).

DEPUTATION TO BIRMINGHAM.

JULY 18, 1919.

A DEPUTATION, consisting of the President, the Rt. Hon. the Lord Lambourne, P.C., C.V.O., with Mr. F. J. Chittenden, F.L.S., V.M.H., Director of Wisley, Mr. James Hudson, V.M.H., Mr. H. B. May, V.M.H., and the Rev. W. Wilks, M.A., V.M.H., Secretary of the Society, visited the Summer Show of the Birmingham Horticultural Society.

The Deputation were received at the Birmingham New Street Station at 7 P.M. on Thursday, July 17, by Mr. Morter, Superintendent of the Birmingham Parks, &c., and were most hospitably entertained at dinner at the Queen's Hotel, Mr. E. H. Weaver, Chairman of the Birmingham Horticultural Society, presiding.

After the usual loyal toasts, Mr. Weaver proposed prosperity to the Royal Horticultural Society in a graceful speech to which the Rev. W. Wilks, Secretary of the R.H.S., responded. Mr. Councillor Johnson proposed success to the Birmingham Society, which was received with much applause and responded to by Mr. Webster, the Secretary.

The following morning, Friday, July 18, the Deputation were driven to the Show Ground by Mr. Morter, and after most careful consideration they made the following awards:—

Award of Merit.

Carnation, 'Firelight,' from Messrs. C. Wall, Melrose Nurseries, Bath. A strong border variety with light scarlet flowers.

Gold Medal.

To Messrs. Sutton, Reading, for a group of vegetables, fruits, and flowers.

To Messrs. Gunn, Olton, for Roses.

To Messrs. Blackmore & Langdon, Twerton, Bath, for Begonias and Gloxinias.

To Mr. Herbert Jones, of Bath, for an Old English Formal Garden.

Silver-gilt Flora Medal.

To Sir G. W. Kendrick (gr. J. V. Macdonald), Whetstone, Edgbaston, for a group of foliage plants.

To Messrs. E. Hicks, Hurst, Twyford, for Roses.

To Mr. John Mattock, Eddington, for Roses.

Silver-gilt Knightian Medal.

To Messrs. Webb, Wordsley, for a group of vegetables, fruits, and flowers.

Silver-gilt Banksian Medal.

To Board of Agriculture (Mr. V. Banks), for bottled fruits, &c.

To Mr. H. Green (gr. Geo. W. Marsh), Amberley House, Gravelly Hill, Birmingham, for a group of foliage plants.

To Messrs. E. W. King, Coggeshall, for Sweet Peas.

Silver Flora Medal.

To Miss S. S. Thompson, 58 Alfred Road, Handsworth, for succulents.

To Mr. J. A. Kendrick (gr. A. Cryer), Barrow's Court, Edgbaston, for a group of foliage plants.

To Mr. W. Holloway, Percyville, Northill Gardens, Shrewsbury, for Sweet Peas.

To Messrs. C. Wall, Melrose Nurseries, Bath, for Carnations.

To Messrs. Herd Bros., Penrith, for Sweet Peas.

To Messrs. J. Douglas, Great Bookham, for Carnations.

Silver Banksian Medal.

To Major Webb (gr. W. Gaiger), Spring Grove, Bewdley, for vegetables.

To Mr. J. A. Kendrick (gr. A. Cryer), Barrow's Court, Edgbaston, for ferns.

Bronze Flora Medal.

To Mr. W. Bown, 26 Haughton Road, Birchfields, Birmingham, for Begonias and Gloxinias.

To Messrs. K. Luxford, Harlow, for Carnations.

To Mr. G. Tangye, Birmingham (gr. W. Tompkins), for miscellaneous decorative plants.

lxxiv PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Bronze Knightian Medal.

To Mr. W. G. Gresson (gr. T. Perry), Stoke House, Severn Stoke, Worcester, for vegetables.

Bronze Banksian Medal.

To Mr. H. Davies, Hawthorne, Witton Street, Stourbridge, for vegetables.

To Mr. W. E. Barber, 1 Witton Street, Bournville, for vegetables.

To Mr. C. F. Hopkins, 97 Melton Street, King's Heath, for vegetables.

To Mr. M. T. Hudman, Station Cottage, Hamstead, Birmingham, for vegetables.

To Mr. W. Perkes, Stourbridge, for vegetables.

To Mr. W. E. Barker, 1 Witton Street, Bournville, for vegetables and salads.

To Mr. W. Green, 49 Bank Street, Summers Lane, Birmingham, for annual flowers.

To Mr. C. F. Hopkins, 97 Melton Street, King's Heath, for perennial flowering plants.

At noon the Show was visited by the Rt. Hon. Sir David Brooks, Lord Mayor of Birmingham, and Lady Brooks, the Lady Mayoress.

A large number of people having gathered together at the entrance to the tents, the Lord Mayor, in a few eloquent words, extended a cordial welcome to the Deputation and thanked the Society for sending them. Alderman Sanders, J.P., having then moved a formal vote of thanks to Lord Lambourne, President of the R.H.S., and Councillor Johnson, B.A., having seconded it, Lord Lambourne briefly responded.

At 1 o'clock the Deputation were entertained at luncheon, together with the Judges, Committees, and other local officials, the Rt. Hon. the Lord Mayor presiding. After the usual loyal toasts, Lord Lambourne rose and proposed "Prosperity to the Birmingham Horticultural Society."

Mr. E. H. Weaver, Chairman of the Society, responded.

GENERAL MEETING.

JULY 29, 1919.

Mr. F. J. CHITTENDEN, F.L.S., V.M.H., in the Chair.

Fellows elected (36).—F. L. Baldwin, A. Bell, Miss Benett, Lady Bergne, Mrs. Betterton, C. Bowring, H. S. Button, Capt. J. L. Cotter, Lady Craig, A. W. Davies, W. R. Dunstan, Mrs. Edge, J. F. Edwards, W. H. Edwards, Mrs. J. H. Evans, C. F. Faulkner, Mrs. M. Frith, Mrs. J. S. Graham, D. Henriques, Mrs. H. W. Kennard, Miss M. B. Knight, Mrs. Master, H. F. Methven, Miss J. A. Moore, J. S. Pearse, J. S. Phillips, L. P. Roberts, A. Sanders, Lady Scott, W. S. Shackleton, A. P. Simon, W. Stevenson, W. Trotter, H. J. Watson, Mrs. H. V. Whitelaw, M. F. Yorke.

Fellows resident abroad (2).—A. B. Bell, P. Falk.

Associates (2).—F. Douglas, Miss M. Foster.

A lecture was read by Prof. Bickerton on "Botany in relation to other Sciences."

GENERAL MEETING.

AUGUST 12, 1919.

Mr. C. G. A. Nix, O.B.E., in the Chair.

Fellows elected (27).—R. Allen, C. J. Bailey, Sir Stanley Bois, Sir Harry Boulton, Mrs. F. P. Brettell, H. H. Butts, Mrs. G. H. Cartland, W. H. Chappell, Miss H. Cruikshank, C. W. Cohen, Miss M. F. Dawson, Mrs. M. T. Edwards, W. Farrer, G. W. Giles, Mrs. Gosling, Miss M. D. Hall, D. K. Knayle, J. H. Mather, J. B. Melchior, Miss E. Notley, A. G. Scorer, E. E. Shepperd, Moyses Stevens, G. H. Thompson, C. Tyler, W. S. White, A. E. Wiles.

Fellows resident abroad (3).—M. Davey, M. Kamro, J. K. Sircar.

Affiliated Societies (1).—Walton-on-Naze Allotment and Garden Association.

A lecture on "Fruit Trees in Pots" was read by Mr. James Hudson, V.M.H.

EXHIBITION OF HARDY BRITISH-GROWN FLOWER BULBS.

Class 3. Amateurs.—Collection of 20 varieties of Dry Home-grown Hardy Flower Bulbs, 10 bulbs of each variety, including not more than 7 varieties of Daffodils, nor more than 6 varieties of Tulips (Darwin or Cottage).

First Prize, £2 10s. ; Second, £1 10s. ; Third, £1.

NOTE.—An exhibitor in Class 3 was not allowed to exhibit in Class 4.

No entries.

Class 4. Amateurs.—Collection of 10 varieties of Dry Home-grown Hardy Flower Bulbs, 10 bulbs of each variety, including not more than 3 varieties of Daffodils, nor more than 3 varieties of Tulips (Darwin or Cottage).

First Prize, £2 10s. ; Second, £1 10s. ; Third, £1.

No entries.

Class 5. Open.—Collection of 20 varieties of Home-grown Daffodils, 20 'Single' Bulbs of each variety ; in a space of 10 ft. by 3 ft.

Silver Banksian Medal.

Donard Nursery Co., Newcastle, Co. Down.

Class 6. Open.—Collection of 15 varieties of Home-grown Daffodils, 10 large 'Family or Cluster' Bulbs of each.

Silver Banksian Medal.

Donard Nursery Co.

Class 7. Open.—Collection of 10 varieties of Home-grown Market Varieties of Daffodils, 20 'Single' Bulbs of each, including 'Emperor,' 'Empress,' 'Golden Spur,' 'Victoria,' 'Sir Watkin,' '*Barrii conspicuus*,' and '*P. ornatus*'; in a space 7 ft. by 3 ft.

No entries.

Class 8. Open.—Collection of 20 varieties of Home-grown Early Tulips, 20 bulbs of each, in a space 10 ft. by 3 ft.

Silver Flora Medal.

Geo. Monro, Jr., The Maltings, Spalding, Lincs.

Class 9. Open.—Collection of 20 varieties of Home-grown May-flowering Tulips (Darwin or Cottage), 20 bulbs of each, in a space 10 ft. by 3 ft.

Silver Flora Medal.

Donard Nursery Co.

Silver Banksian Medal.

Geo. Monro, Jr.

Class 10. Open.—Collection of any Dry Home-grown Hardy Flower Bulbs, Tubers, Rhizomes, &c., other than Daffodils or Tulips. Not more than 40 varieties, nor more than 30 bulbs, &c., of any one kind to be exhibited. Diversity of Genera and Species will be favourably considered by the judges ; space to be 15 ft. by 3 ft.

No entries.

GENERAL MEETING.

AUGUST 26, 1919.

Mr. H. J. PAGE, B.Sc., M.B.E., in the Chair.

Fellows elected (25).—E. S. Attrell, A. Baxter, Mrs. H. C. Brown, Capt. W. B. Burton-Baldry, J. Cardwell, Lieut.-Col. T. G. Clark, G. Eyre, A. Finsler, Mrs. D. Forster-Tuck, H. T. Gallagher, Mrs. A. Knowles, Dr. J. C. McConaghey, Mrs. J. C. McConaghey, Mrs. H. Mills, J. S. Motion, J. Noonam, J. Ogilvie, R. J. Sainsbury, C. W. Tennant, G. Trinder, Jas. Walker, S. H. White, G. W. Williams, E. L. Winter, Mrs. A. Wolff.

Fellow resident abroad (1).—J. Orishimo.

Affiliated Societies (4).—Alton Horticultural Society, Ospringe Cottage Garden Association, Queen's Ground Allotment Association, Stafford District Allotment Association.

GENERAL MEETING.

SEPTEMBER 9, 1919.

Mr. A. J. GASKELL in the Chair.

Fellows elected (3).—Capt. Hon. H. R. C. Balfour, L. H. Bentall, J. Cobley.

Fellow resident abroad (1).—Wilfred L. Dence.

A lecture on "Carnations—their Pests and Diseases" was read by Mr. M. C. Allwood (see p. 233).

R.H.S. VEGETABLE MEETING.

SEPTEMBER 23, 1919.

Class 1.—Twelve kinds distinct, to be selected from the following:—Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrots, Celery, Cucumbers, Endive, Leeks, Lettuce, Mushrooms, Onions, Parsnips, Peas, Potatos, Tomatos, Turnips, Beans (Runner or French), Vegetable Marrow.

First Prize, The Sutton Challenge Cup (value £21) and £5; Second, £4; Third, £3.

1. Mr. J. S. Kelly, Claremont, Esher.

Class 2.—Nine kinds distinct, to be selected from the list in Class 1. The object of this Class is to illustrate not only those vegetables which are in daily use, but specially the quality and size in which they are most acceptable and useful for table use, and possess the qualities most valued for table use by cooks.

First Prize, The Gordon Lennox Challenge Cup and £4; Second, £3; Third, £2.

1. Mrs. Jenner, Wenvoe Castle, nr. Cardiff (gr. H. Wheeler).

2. W. H. Myers, Esq., Swanmore House, Bishops Waltham (gr. G. Ellwood).

Class 3. Six kinds distinct, to be selected from the list in Class 1.

First Prize, £3; Second, £2; Third, £1.

1. C. A. Cain, Esq., The Node, Welwyn, Herts (gr. T. Pateman).

2. W. D. Bedford, Esq., The Braes, Berkhamsted.

3. G. Thorn, Esq., Willesborough, Ashford, Kent (gr. M. Hoad).

Class 4.—Potatos, 12 varieties distinct.

First Prize, £3; Second, £2; Third, £1.

1. G. Thorn, Esq.

2. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).

3. C. A. Cain, Esq.

Class 5.—Potatos, 6 varieties distinct.

First Prize, £1 10s.; Second, £1; Third, 10s.

1. Rt. Hon. T. Halsey, Graddesden Place, Hemel Hempstead (gr. T. Avery).

2. F. Hoad, Esq., Albemarle Road, Willesborough, Kent.

3. A. G. McMeekin, Esq., Raymead Cottage, Boulter's Lock, Maidenhead (gr. J. Cox).

Class 6.—Onions, 6 varieties distinct, as follows:—

Two dishes of the 'Ailsa Craig' type, one oval and the other round; one dish of Red Onions, one dish of Silverskins; one dish of James' or other selection of long-keeping brown Globe Onions; one dish of White Spanish or Nuneham Park type (flat, not Globe).

N.B.—More than 2 dishes of selections of 'Ailsa Craig' type, or varieties indistinguishable from it, will disqualify.

First Prize, £2; Second, £1; Third, 10s.

1. Mrs. Jenner.

2. W. H. Myers, Esq.

3. W. D. Bedford, Esq.

Class 7.—Salads, 6 kinds distinct, each kind to be staged separately.

First Prize, £2; Second, £1; Third, 15s.

1. W. H. Myers, Esq.

2. J. S. Kelly, Esq.

Single Dish Classes for Amateurs.

In Classes 8–38 the First Prize is in each case 10s. ; the Second, 7s. 6d. ; the Third, 5s. The specimens shown in each Class must be always of one and the same variety.

Class 8.—Beans, Scarlet Runners.

1. W. H. Myers, Esq.
2. Mrs. Jenner.
3. Mrs. Austen, Capel Manse, Horsmonden, Kent (gr. A. Woodgate).

Class 9.—Beans, French Climbers.

1. W. H. Myers, Esq.
2. Mr. J. S. Kelly.
3. R. Staward, Esq., Panshanger, Hertford.

Class 10.—Beans, French Dwarf.

1. Hon. A. H. Mills, Mapledurham House, Reading (gr. S. Kidley).
2. Mr. J. S. Kelly.
3. W. H. Myers, Esq.

Class 11.—Beet, Globe type.

1. Mrs. Austen.
2. Sir Montagu Turner, Bedfords, Havering, Romford (A. J. Barrett).
3. G. Thorn, Esq.

Class 12.—Beet, Long type.

1. Mr. J. S. Kelly.
2. C. A. Cain, Esq.
3. W. H. Myers, Esq.

Class 13.—Brussels Sprouts, 50 buttons.

1. Mrs. Jenner.
2. C. A. Cain, Esq.
3. Mrs. Farnham, The Heights, Witley, Surrey.

Class 14.—Brussels Sprouts, 3 plants.

1. W. H. Myers, Esq.

Class 15.—Cabbage.

1. W. H. Nockolds, Esq., Nutfield Court, Surrey (gr. T. W. Herbert).
2. Mrs. Farnham.
3. Mr. J. S. Kelly.

Class 16.—Cabbage, Savoy.

1. H. C. Gardner, Esq., Ruxley Lodge Gardens, Claygate, Surrey.
2. Mrs. Farnham.

Class 17.—Cauliflower or Broccoli.

1. Mrs. Jenner.
2. Mr. J. S. Kelly.
3. W. H. Myers, Esq.

Class 18.—Celeriac.

No entries.

Class 19.—Celery, White.

1. Mr. J. S. Kelly.
2. Mrs. Farnham.

Class 20.—Celery, Red.

1. Mr. J. S. Kelly.
2. Mrs. Farnham.
3. Sir Montagu Turner.

Class 21.—Cucumbers.

1. Hon. A. H. Mills.
2. G. Thorn, Esq.
3. W. H. Myers, Esq.

Class 22.—Leeks.

1. Mr. J. S. Kelly.
2. C. A. Cain, Esq.
3. Mrs. Jenner.

Class 23.—Marrows.

1. J. B. Fortescue, Esq.
2. Rt. Hon. T. Halsey.
3. R. Staward, Esq.

Class 24.—Mushrooms.

3. W. H. Myers, Esq.

Class 25.—Onions.

1. Mrs. Jenner.
2. W. Lintott, Esq., Marden Park, Woldingham.
3. Mrs. Farnham.

Class 26.—Parsnips.

1. R. Staward, Esq.
2. Mrs. Jenner.
3. Mr. J. S. Kelly.

Class 27.—Carrots, Long.

1. J. B. Fortescue, Esq.
2. R. Staward, Esq.
3. Mr. J. S. Kelly.

Class 28.—Carrots, stump-rooted or short.

2. Mrs. Jenner.
1. Mr. J. S. Kelly.
3. D. W. Bedford, Esq.

Class 29.—Peas.

1. Mrs. Jenner.
2. Mr. J. S. Kelly.
3. Mrs. Farnham.

Class 30.—Turnips, white skin and flesh.

1. R. Staward, Esq.
2. Sir Montagu Turner.
2. Rt. Hon. T. Halsey.

Class 31.—Turnips, purple-top, red-top, or green-top, flesh white.

1. Mrs. Austen.
2. R. Staward, Esq.
3. D. W. Bedford, Esq.

Class 32.—Turnips, yellow flesh.

1. D. W. Bedford, Esq.
2. Mrs. Jenner.
3. Rt. Hon. T. Halsey.

Class 33.—Potatos, white.

1. Rt. Hon. T. Halsey.
2. W. H. Myers, Esq.
3. G. Thorn, Esq.

Class 34.—Potatos, coloured.

1. Rt. Hon. T. Halsey.
2. Sir Montagu Turner.
3. Mrs. Wallis-Toller, Woodside, Elgin Road, Weybridge (gr. G. Crabb).

Class 35.—Kale, Curled.

1. C. A. Cain, Esq.
2. W. H. Myers, Esq.

Class 36.—Tomatos, Red.

1. Rt. Hon. T. Halsey.
2. W. Lintott, Esq.
3. Mrs. Jenner.

Class 37.—Tomatos, Yellow.

1. W. H. Myers, Esq.
2. Mrs. Jenner.
3. G. Thorn, Esq.

Class 38.—Any other Vegetable not named above.

1. Mrs. Jenner.
2. C. A. Cain, Esq.
3. Mr. J. S. Kelly.

GENERAL MEETING.

SEPTEMBER 23, 1919.

Mr. JAS. HUDSON, V.M.H., in the Chair.

A lecture on "Fruit Tree Stocks" was read by Mr. R. G. Hatton, M.A. (see p. 257).

GENERAL MEETING.

OCTOBER 7, 1919.

Mr. C. G. A. NIX, O.B.E., in the Chair.

Fellows elected (106).—S. S. Allen, G. R. Baker, Mrs. G. R. Baker, A. S. Banks, J. H. Beale, P. J. Belson, M. Bennett, Mrs. Bevan, A. Birch, F. H. Boxwell, W. H. Braley, C. O. Briggs, Mrs. J. D. Bright, H. Campbell, H. Charman, A. A. Clucas, H. L. Coghlan, H. Cooper, J. S. Cotman, H. Crockford, L. C. Cropper, Mrs. A. H. Crossley, C. Cunliffe, W. H. Dalton, A. Daniel, J. R. Day, M. Dicks, Miss W. Donald, W. R. Facey, A. W. Foster, G. F. Forsdike, M. D. Fowler, Miss M. Foxcroft, G. R. Furze, Miss L. Gardener, Mrs. M. Georges, E. R. Gibbs, George Givan, Lord Glanely, P. Gow, J. L. Gray, G. W. Green, Lieut.-Col. B. E. Gurdon, A. G. Halstead, Lady Hamilton, F. E. Hare, S. Harkey, L. Harris, C. Hart, J. H. Heal, H. H. Henness, J. Herbert, Miss M. A. Herdman, S. J. Hopper, C. Hovenden, R. Ironside, E. Jacques, H. King, Hon. C. N. Lawrence, A. L. Lazarus, Col. Sir Jas. D. L. Legard, Lieut. Col. L. Lloyd Jones, Miss E. M. McCowan, C. W. Mercer, Miss L. L. Miller, W. Miller, G. Mills, Major F. C. Mitchell, Miss G. Mitchell, Lady C. Monro, F. Morlis, L. Myer, Rev. F. Nesbitt, W. C. Nickels, Capt. G. L. Parker, J. H. Penny, Mrs. Philip Percival, A. L. Phillips, W. M. Plevins, C. J. Ramsden, Mrs. F. Ramsden, Rev. H. A. Rhodes, Lord Ruthven, E. E. St. Quinton, G. Savory, Countess of Scarborough, Miss A. Seabourne, J. E. Smith, D. S. Spens-Stewart, Col. H. L. Stafford, Mrs. M. A. Stafford, W. A. Stearns, Miss M. Stewart, R. H. Sutton, H. M. Thornton, J. E. Turner, J. Udall, D. A. Veresmith, Miss B. A. Ward, W. Watkins, R. S. Watson, J. Webber, H. L. Whatley, H. B. Williams, R. Wilson, Mrs. E. M. Wordsworth.

Fellows resident abroad (4).—Miss E. Beghin, R. Burn, O. E. Georgulas, G. W. Marshall.

Associates (2).—C. Gladding, G. Ragless.

Affiliated Societies (5).—Ditchling Horticultural Society, Guildford and District Allotment Holders' Association, Newport and District Gardeners' Mutual Improvement Society, Otago Agricultural and Pastoral Society, St. Davids Horticultural Society.

MEETING FOR BRITISH FRUIT.

DIVISION I.

FRUITS GROWN UNDER GLASS OR OTHERWISE.

OPEN TO GARDENERS AND AMATEURS ONLY.

Class 1.—Collection of 9 dishes of ripe dessert fruit :—6 kinds at least ; only 1 Pine, 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Hogg Medal and £5 ; Second, £4 ; Third, £3.

1. Mr. J. Lock, Oatlands Lodge Gardens, Weybridge.
2. C. A. Cain, Esq., The Node, Welwyn (gr. T. Pateman).

Class 2.—Collection of 6 dishes of ripe dessert fruit :—4 kinds at least ; only 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind, and no two dishes of the same variety. Pineapples excluded.

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10s.

1. Lord Hillingdon, Wildernes, Sevenoaks (gr. J. Shelton).
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).
3. J. T. Tubb, Esq., Bearwood Gardens, Wokingham.

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Class 3.—Grapes, 6 distinct varieties (2 bunches of each), of which two at least must be White.

First Prize, Silver Hogg Medal and £5 ; Second, £4 ; Third, £3.

1. G. Miller, Esq.

Class 4.—Grapes, 4 varieties (2 bunches of each), selected from the following : 'Madresfield Court,' 'Prince of Wales,' 'Muscat Hamburg,' 'Muscat of Alexandria' or 'Cannon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg.'

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10s.

1. Lord Hillingdon.

Class 5.—Grapes, 'Black Hamburg,' 2 bunches.

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Lord Hillingdon.
2. Major J. A. Berners, Wolverstone Park, Ipswich (gr. W. Messenger).
3. Thomas Bowser, Esq., The Gardens, Montacute, Somerset.

Class 6.—Grapes, 'Mrs. Pince,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Lord Hillingdon.
2. Sir Walpole Greenwell, Bt., Marden Park, Woldingham (gr. W. Lintott).

Class 7.—Grapes, 'Alicante,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Mrs. W. Raphael, Castle Hill, Englefield Green (gr. H. Brown).
2. Lord Hillingdon.

Class 8.—Grapes, 'Madresfield Court,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Lord Hillingdon.
2. H. W. Henderson, Esq., Serge Hill, King's Langley (gr. F. L. Pike).

Class 9.—Grapes, 'Prince of Wales,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. G. Mayer, Esq., Wistler's Wood, Woldingham (gr. W. Sayer).
2. Sir Walpole Greenwell, Bt.

Class 10.—Grapes, any other Black Grape, 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Lord Hillingdon.
2. Lt.-Col. St. Maur, Stover Park, Newton Abbot, S. Devon.

Class 11.—Grapes, 'Muscat of Alexandria,' 2 bunches.

First Prize, Silver Knightian Medal and £2 ; Second, £2 ; Third, £1 10s.

1. Lord Hillingdon.
2. Mr. J. Lock.

Class 12.—Grapes, any other White Grape, 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. C. A. Cain, Esq.
2. G. Miller, Esq.

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12 × 3. Thirty dishes distinct, grown entirely in the open ; not more than 12 varieties of Apples or 8 of Pears.

First Prize, Silver Hogg Medal and £2 ; Second, £2.

1. C. A. Cain, Esq.
2. R. Staward, Esq., Panshanger, Hertford.

DIVISION II.

FOR FRUIT GROWN ENTIRELY OUT OF DOORS.

OPEN TO NURSERYMEN ONLY.

Class 14.—30 feet run of 6 feet tabling.

Silver-gilt Knightian Medal.

Seabrook & Sons, The Nurseries, Chelmsford.

Silver-gilt Hogg Medal.

Cannell & Sons, Eynsford, Kent.

Gold Medal.

Geo. Bunyard & Co., Royal Nurseries, Maidstone.

Class 15.—20 feet run of 6 feet tabling.

Gold Medal.

Barnham Nurseries Co., Barnham, Sussex.

Silver Hogg Medal.

H. Close, Littlecroft Nurseries, Holmesdale Road, Orpington.

R. C. Notcutt, The Nursery, Woodbridge.

DIVISION III.

OPEN TO MARKET GROWERS ONLY.

Class 16.—Apples, 20 baskets (cooking and dessert), distinct. Fruit suitable for market purposes will have more consideration than a large number of varieties.

Silver-gilt Knightian Medal.

Ernest Hills, Rhydd Court Nursery, Hanley Castle, Worcs.

Gold Medal.

Lt.-Col. H. Lumley-Webb, Upchurch, Sittingbourne (gr. J. Holloway).

Silver Knightian Medal.

A. Bayley, Bungalow, Lent Rise, Burnham, Bucks.

Silver-gilt Knightian Medal.

H. L. Robson, Guildford Fruit Farm, Guildford.

Silver-gilt Hogg Medal.

(Principal) Miss G. Sanders, Hort. College, Swanley, Kent (gr. R. G. Martin).

DIVISION IV.

FRUITS GROWN ENTIRELY IN THE OPEN AIR.

OPEN TO GARDENERS AND AMATEURS ONLY.

Competitors in Classes 17, 18, 19, 20, 21, and 22, are excluded from Division VII.

NOTE.—Competition is allowed in one class only of the Classes 17, 18, and 21, 22.

Class 17.—Apples, 24 dishes distinct, 16 cooking, 8 dessert.

First Prize Fruiterers' Company Silver-gilt Medal and £3; Second, £3;
Third, £2.

1. C. A. Cain, Esq.

2. Major Hennessy, Tylney Hall, Hook, Hants (gr. J. Hygate).

3. Marquis of Salisbury, Hatfield House, Herts (gr. H. Prime).

Class 18.—Apples, 12 dishes distinct, 8 cooking, 4 dessert.

First Prize, Fruiterers' Company Silver Medal and £2; Second, £1.

1. Wm. Darby, Esq., Knebworth, Herts.

2. G. Miller, Esq.

Class 19.—Cooking Apples, 6 dishes distinct.

First Prize, £1; Second, 15s.

1. C. A. Cain, Esq.

2. Major Hennessy.

Class 20.—Dessert Apples, 6 dishes distinct.

First Prize, £1; Second, 15s.

1. Major Hennessy.

2. C. A. Cain, Esq.

Class 21.—Dessert Pears, 18 dishes distinct.

First Prize, Silver-gilt Knightian Medal and £2; Second, £2; Third, £1.

1. C. A. Cain, Esq.

2. Dr. T. Jackson, Thornton Heath, Surrey.

Class 22.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10s.; Second, £1.

1. G. Miller, Esq.

Class 23.—Plums, 3 dishes distinct.

First Prize, £1; Second, 10s.

1. Major J. Berners.

2. C. H. Combe, Esq., Cobham Park, Cobham, Surrey (gr. G. Kember).

Class 24.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10s.; Second, 7s. 6d.

1. V. C. Vickers, Esq., Newsells Park, Royston, Herts (gr. W. Watkins).

Class 25.—Morello Cherries, 50 fruits.

First Prize, 7s.; Second, 5s.

No entries.

Class 26.—Autumn Raspberries, 1 dish of 50 fruits.

First Prize, 7s.; Second, 5s.

1. Major J. A. Berners.

Class 27.—Figs, grown entirely out of doors, dish of 9 fruits of one variety.

First Prize, 7s.; Second, 5s.

No entries.

DIVISION V.

SPECIAL DISTRICT COUNTY PRIZES.

OPEN TO GARDENERS AND AMATEURS ONLY; ALL FRUIT MUST HAVE BEEN GROWN ENTIRELY IN THE OPEN.

AA. Apples, six dishes distinct, four cooking, two dessert.

First Prize, £1, and 3rd Class single fare from Competitor's nearest railway station to London.

Second Prize, 15s. and railway fare as above.

Class 28.—Open only to Kent growers.

AA. { 1. Rev. J. R. Leigh, The Vicarage, Yalding, Kent (gr. G. Johnson).
2. J. H. Loudon, Esq., Olantigh Gardens, Wye, Kent (gr. John Bond).

BB. Pears, Dessert, six dishes distinct.

First Prize, £1 10s. and railway fare as above.

Second Prize, £1 and railway fare as above.

BB. { 1. Rev. H. A. Bull, Wellington House, Westgate (gr. F. A. King).
2. J. H. Loudon, Esq.

Class 29.—Open only to growers in Surrey, Sussex, Hants.

AA. { 1. Hon. Mrs. Greville, Polesden Lacy, Dorking (gr. H. Prince).
2. C. H. Combe, Esq.

BB. { 1. W. H. Nockolds, Esq.

2. R. Ramsden, Esq., Siddinghurst, Chiddingfold.

Class 30.—Open only to growers in Wilts, Dorset, Somerset, Devon, and Cornwall.

AA. { 1. Lt.-Col. St. Maur.

2. J. Copp, Esq., Ferndale, Teignmuth.

BB. 1. Major F. Wingfield-Digby, Sherborne Castle, Dorset (gr. T. Turton).

Class 31.—Open only to growers in Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA. { 1. Sir Edward Pearson, Brickendonbury, Hertford (gr. W. Stephenson).
2. V. C. Vickers, Esq.

BB. { 1. Sir Edward Pearson.
2. V. C. Vickers, Esq.

Class 32.—Open only to growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA. { 1. Major J. A. Berners.

2. Sir Montagu Turner, Bedfords, Havering, Romford (gr. A. Barrett).

BB. 1. Major J. A. Berners.

Class 33.—Open only to growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

- AA. { 1. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. J. Taylor).
 { 2. M. Firth, Esq., Carlton Park, Market Harborough (gr. R. Thatcher).
 BB. 1. F. Bibby, Esq.

Class 34.—Open only to growers in Worcester, Hereford, Monmouth, and Wales.

- AA. { 1. Earl of Coventry, Crooms Court, Severn Stoke, Worcester (gr. W. Wilson).
 { 2. T. Jones, Esq., Pen-y-lan, Ruabon.
 BB. { 1. T. Jones, Esq.
 { 2. H. Davies-Evans, Esq., Highmead, Llanybyther, South Wales.

Class 35.—Open only to growers in the six northern counties of England, and in the Isle of Man.

- AA. { 1. William Orr, Esq., Woodwell House, Silverdale, *via* Carnforth.
 { 2. James Cocker, Esq., Chester Gardens, Humshaugh, Northumberland.
 BB. 1. William Orr, Esq.

Class 36.—Open only to growers in Scotland.

- AA. 1. Captain C. L. Gordon, Threave House, Castle Douglas (gr. James Duff).

Class 37.—Open only to growers in Ireland.

- AA. 1. C. B. Broad, Esq., Aghern, Conna, Co. Cork.

Class 38.—Open only to growers in the Channel Islands.

No entries.

DIVISION VI.

OPEN ONLY TO AMATEURS POSSESSING A TOTAL OF NOT MORE THAN
25 APPLE TREES.

Class 39.—One dish of 6 fruits of one dessert variety.

First Prize, Silver Banksian Medal; Second Prize, Bronze Knightian Medal; Third Prize, Bronze Banksian; Fourth Prize, Highly Commended Certificate; Fifth Prize, Commended Certificate.

1. F. E. Still, Esq., Old Rectory, Nutfield (gr. W. H. Herbert).

Class 40.—One dish of 6 fruits of 1 cooking variety.

Prizes as in Class 39.

1. F. E. Still, Esq.
 2. John Jones, Esq., 27 Hindmans Road, East Dulwich, S.E.

DIVISION VII.

SINGLE DISHES OF FRUIT GROWN ENTIRELY IN THE OPEN AIR.
(Six Fruits to a Dish.)

OPEN TO GARDENERS AND AMATEURS ONLY.

In each Class, except 57, 58, 80, 99, and 100, as follows:—First Prize, 7s.; Second Prize, 5s.; but when the entries exceed six in any Class the Judges may recommend a Third Prize of 4s.

Choice Dessert Apples.

The Judges were instructed to prefer Quality, Colour, and Finish to mere size.

Class 41.—Adams' Pearmain.

1. Lt.-Col. St. Maur.
 2. J. H. Loudon, Esq.
 3. Major Wingfield-Digby.

Class 42.—Allington Pippin.

1. Lt.-Col. St. Maur.
 2. C. W. Darley, Esq., Longheath, Little Bookham, Surrey (gr. A. Hestor).
 3. Major J. A. Berners.

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Class 43.—American Mother.

1. John T. Tubb, Esq.
2. F. C. Stoop, Esq., West Hall, Byfleet, Surrey (gr. G. Carpenter).
3. Lady E. Wyndham Quin, Castletown, Carrick-on-Suir, Ireland (gr. C. Garner).

Class 44.—Barnack Beauty.

1. J. A. Stidston, Esq., Bishopsteignton, Teignmouth, Devon.
2. F. C. Stoop, Esq.
3. Major Wingfield-Digby.

Class 45.—Blenheim Orange.

1. Mrs. Leveson-Gower, Bill Hill, Wokingham, Berks (gr. W. Chislett).
2. F. M. Vokes, Esq., Birch Lawn, Sholing, Hants.
3. J. T. Tubb, Esq.

Class 46.—Charles Ross.

1. F. Bibby, Esq.
2. Hon. Mrs. R. Greville.
3. Lt.-Col. St. Maur.

Class 47.—Claygate Pearmain.

1. J. T. Tubb, Esq.
2. W. B. Wright, Esq., 14 Brambledown Road, Wallington.
3. Mrs. Leveson-Gower.

Class 48.—Cox's Orange.

1. Rev. G. H. Engleheart, Dinton, Salisbury.
2. Major J. A. Berners.
3. Lady Elphinstone, "Maryland," Worplesdon (gr. G. Graves).

Class 49.—Egremont Russet.

1. Mrs. Helsham-Jones, Tile Barn, Woolton Hill, Newbury (gr. F. Lock).
2. Major Wingfield-Digby.
3. J. T. Tubb, Esq.

Class 50.—James Grieve.

1. John Copp, Esq.
2. J. H. Loudon, Esq.
3. G. F. Marsh, Esq., Morningside, Marchmont Road, Wallington.

Class 51.—Lord Hindlip.

1. Lt.-Col. St. Maur.
2. J. H. Loudon, Esq.
3. Major J. A. Berners.

Class 52.—Margil.

1. Lt.-Col. St. Maur.
2. Sir E. Pearson.
3. Major Wingfield-Digby.

Class 53.—Ribston Pippin.

1. Mrs. Leveson-Gower.
2. Lt.-Col. St. Maur.
3. Mrs. Helsham-Jones.

Class 54.—Rival.

1. Hon. Mrs. Greville.
2. J. H. Loudon, Esq.
3. Lt.-Col. St. Maur.

Class 55.—St. Edmund's Pippin.

1. Major Wingfield-Digby.
2. J. T. Tubb, Esq.
3. Hon. Mrs. R. Greville.

Class 56.—Wealthy.

1. F. Bibby, Esq.
2. Major Wingfield-Digby.
3. Mrs. Helsham-Jones.

Class 57.—Eight fruits of any early variety, not named above, fit for use.

Four Prizes, 7s., 6s., 5s., 4s.

1. E. Holland, Esq., Silverdale, Sutton, Surrey.
2. W. B. Wright, Esq.
3. J. C. Fitzwilliam, Esq., Milton Park, Peterboro' (gr. W. Green).
4. W. H. Nockolds, Esq.

Class 58.—Eight fruits of any late variety, not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. John T. Tubb, Esq.
2. Major J. A. Berners.
3. Hon. Mrs. R. Greville.
4. Mrs. Leveson-Gower.

Choice Cooking Apples.

N.B.—The Judges were instructed to prefer Quality and Size to mere Colour.

Class 59.—Beauty of Kent.

1. C. W. Darley, Esq.
2. E. J. Holland, Esq.
3. Sir Jeremiah Colman, Gatton Park, Reigate (gr. J. Collier).

Class 60.—Bismarck.

1. J. A. Stidston, Esq.
2. Hon. Mrs. R. Greville.
3. J. S. Kelly, Esq.

Class 61.—Blenheim Orange (large fruits).

1. Rev. J. R. Leigh.
2. Mrs. Leveson-Gower.
3. R. S. Gardiner, Esq., Hardres Court, Canterbury (gr. W. Skinner).

Class 62.—Bramley's Seedling.

1. J. C. Fitzwilliam, Esq.
2. F. C. Stoop, Esq.
3. Hon. Mrs. R. Greville.

Class 63.—Dumelow's Seedling, *syns.* Wellington and Normanton Wonder.

1. C. W. Darley, Esq.
2. Major Wingfield-Digby.
3. Lt.-Col. St. Maur.

Class 64.—Ecklinville.

1. William Orr, Esq.
2. W. H. Nockolds, Esq.
3. J. H. Loudon, Esq.

Class 65.—Edward VII.

1. J. T. Tubb, Esq.
2. Lt.-Col. St. Maur.

Class 66.—Emneth Early, *syn.* Victoria.

No entries.

Class 67.—Gascoyne's Scarlet (large fruits).

1. Lt.-Col. St. Maur.
2. J. H. Loudon, Esq.
3. C. W. Darley, Esq.

Class 68.—Golden Noble.

1. J. T. Tubb, Esq.
2. F. C. Stoop, Esq.
3. Mrs. Leveson-Gower.

Class 69.—Grenadier.

1. J. H. Loudon, Esq.
2. R. S. Gardiner, Esq.

Class 70.—Lane's Prince Albert.

1. C. H. Combe, Esq.
2. F. M. Vokes, Esq.
3. Sir Edward Pearson.

Class 71.—Lord Derby.

1. Rev. J. R. Leigh.
2. Lady Wyndham-Quin.
3. G. F. Marsh, Esq.

Class 72.—Mère de Ménage.

1. Lt.-Col. St. Maur.
2. Major Wingfield-Digby.
3. C. H. Combe, Esq.

Class 73.—Newton Wonder.

1. Earl of Coventry.
2. Rev. J. R. Leigh.
3. Sir Walpole Greenwell.

Class 74.—Peasgood's Nonesuch.

1. Thomas Bowser, Esq.
2. J. T. Tubb, Esq.
3. J. C. W. Fitzwilliam, Esq.

Class 75.—Potts' Seedling.

1. Major Wingfield-Digby.
2. C. W. Darley, Esq.
3. W. Northover, Esq., Stanhope Road, Highgate, N. 6.

Class 76.—Rev. W. Wilks.

1. Hon. Mrs. R. Greville.
2. Sir Edward Pearson.
3. Sir Montagu Turner.

Class 77.—Stirling Castle.

1. Lt.-Col. St. Maur.
2. G. F. Marsh, Esq.
3. J. A. Stidston, Esq.

Class 78.—The Queen.

1. J. H. Loudon, Esq.
2. Lt.-Col. St. Maur.
3. Thomas Bowser, Esq.

Class 79.—Warner's King.

1. Thomas Bowser, Esq.
2. F. N. Horne, Esq., Colley Manor, Reigate Heath (gr. E. Coleman).
3. Lt.-Col. St. Maur.

Class 80.—Eight fruits of any variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. E. J. Holland, Esq.
2. J. H. Loudon, Esq.
3. C. H. Combe, Esq.
4. Sir Montagu Turner.

Choice Dessert Pears.

Class 81.—Beurré d'Anjou.

1. Major Wingfield-Digby.
2. F. N. Horne, Esq.

Class 82.—Beurré Dumont.

1. J. T. Tubb, Esq.

Class 83.—Beurré Bosc.

1. J. T. Tubb, Esq.
2. Major Wingfield-Digby.

Class 84.—Beurré Hardy.

1. Rev. H. A. Bull.
2. Major J. A. Berners.
3. Major Wingfield-Digby.

Class 85.—Beurré Superfin.

1. Major J. A. Berners.
2. Major Wingfield-Digby.
3. Mrs. Austin, Ellern Meade, Totteridge, Herts (gr. E. Longhurst).

Class 86.—Conference.

1. G. F. Marsh, Esq.
2. Major J. A. Berners.
3. H. Shipley, Esq., The Bungalow, Cobham, Surrey.

Class 87.—Doyenné du Comice.

1. Major Wingfield-Digby.
2. C. H. Combe, Esq.
3. H. Shipley, Esq.

Class 88.—Durondeau.

1. G. F. Marsh, Esq.
2. Major J. A. Berners.
3. J. Osborne, Esq., Drynham, Oatlands Chase, Walton on Thames (gr. W. Cooke).

Class 89.—Easter Beurré.

1. J. T. Tubb, Esq.
2. W. H. Henderson, Esq.

Class 90.—Emile d'Heyst.

1. Major Wingfield-Digby.
2. Major J. A. Berners.

Class 91.—Fondante d'Automne.

1. C. H. Combe, Esq.
2. Lt.-Col. Clarke, Loughton Hall, Essex (gr. W. Staward).
3. Sir Montagu Turner.

Class 92.—Glou Morceau.

1. Major J. A. Berners.
2. Major Wingfield-Digby.
3. J. S. Kelly, Esq.

Class 93.—Joséphine de Malines.

1. Major J. A. Berners.
2. C. H. Combe, Esq.

Class 94.—Louise Bonne of Jersey.

1. E. J. Holland, Esq.
2. G. F. Marsh, Esq.
3. H. Shipley, Esq.

Class 95.—Marie Louise.

1. C. H. Combe, Esq.
2. Hon. Mrs. R. Greville.
3. Major J. A. Berners.

Class 96.—Nouvelle Fulvie.

1. Major Wingfield-Digby.
2. J. T. Tubb, Esq.

Class 97.—Thompson.

1. Major Wingfield-Digby.

Class 98.—Winter Nelis.

1. Major Wingfield-Digby.
2. J. T. Tubb, Esq.

Class 99.—Eight fruits of any early variety not named above

Four Prizes, 7s., 6s., 5s., 4s.

1. Major J. A. Berners.
2. C. W. Darley, Esq.
3. C. H. Combe, Esq.
4. J. T. Tubb, Esq.

Class 100.—Eight fruits of any late variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. P. Armitage, Esq., Nettlebed Vicarage, Henley on Thames.
2. Major J. A. Berners.
3. C. H. Combe, Esq.
4. Mrs. Austin.

AFFILIATED SOCIETIES CHALLENGE CUP.

APPLES AND PEARS.

Six Dishes, distinct, Cooking Apples ; Six Dishes, distinct, Dessert Apples ; Six Dishes, distinct, Dessert Pears, six Fruits to each dish. No two Societies may combine, and each Society competing collects all the specimens shown from amongst its own members only, and not from outside.

First, Challenge Cup to be held for twelve months, and Silver Gilt Knightian Medal ;

Second, Silver Gilt Banksian Medal.

1. Knebworth and District Hort. Society.—Hon. Sec., C. H. Sands, Esq., Milestone Road, Knebworth.

THE BUNYARD SILVER CUP.

This Cup, value £21, is offered at the Autumn Fruit Shows in 1919 and 1920 for the most promising seedling Apple or Pear which has not been previously exhibited at any of the Society's Meetings. Six fruits of the seedling must be exhibited in 1919 and six more in 1920, in order that the judgment of the previous year may be confirmed—if confirmed in 1920 the Cup will then be awarded ; but if in 1920 the seedling shall not be considered to have maintained its previous promise, the Cup will be offered afresh in 1921.

In 1919 'Queen Mary,' shown by Mr. E. J. Parsons, of 18 St. Nicholas Street, Worcester, was chosen as worthy of being seen again in 1920 for this Cup.

GENERAL MEETING.

OCTOBER 21, 1919.

Mr. A. W. SUTTON, F.L.S., V.M.H., in the Chair.

Fellows elected (54).—M. C. Atkinson, Lady Beauchamp, W. N. Black, J. Chapman, W. J. Chittenden, J. A. Christopher, J. C. Copley, Mrs. T. Davies, Miss W. M. Davis, T. W. Dawe, Francis Dean, H. W. Edwards, Mrs. M. Erith, Mrs. M. Evans, Mrs. Garrett, G. Geary, Mrs. C. H. Gray, Mrs. R. P. Grieve, F. S. Griffith, J. Harding, Mrs. W. Hatch, R. Hayne, G. Hillier, G. Honey, Major C. C. Hurst, Capt. A. E. Innes, A. Jones, Miss C. S. Joule, Mrs. R. E. Lambert, Mrs. A. L. Leof, J. L. Lloyd, H. V. Mackintosh, F. C. Mason, T. H. Mordey, E. R. Priestly, Mrs. L. Railing, D. L. Ramsey, Mrs. M. L. Relph, A. Rendle, Mrs. Rudolf, Capt. J. A. Scott, Mrs. J. A. Scott, Miss R. F. Skelton, B. S. Standen, Lieut.-Col. W. G. Stoner, Capt. P. G. Tillard, H. J. Tremellem, A. H. Walker, Miss M. Wheen, Col. W. L. White, C. Williams, R. Winter, C. H. Wise, John Youatt.

Associates (4).—E. S. Allinson, Jas. Dobson, S. W. Sherlock, K. P. Worsley.

Affiliated Societies (4).—Orpington Horticultural Society, Stanley and West Croydon Allotment Society, Trecynon Horticultural Society, Tylorstown and District Horticultural Society.

A lecture on "Soil Sickness and Soil Sterilization" was given by Dr. E. J. Russell, F.R.S. (see p. 237).

GENERAL MEETING.

NOVEMBER 4, 1919.

Mr. A. W. SUTTON, F.L.S., V.M.H., in the Chair.

Fellows elected (35).—Mrs. D. Benham, Miss H. D. Bensley, F. W. Berry, E. G. H. Bishop, W. E. Briggs, W. Bunn, Mrs. I. Chapman, Mrs. E. R. Cutler, J. C. Dewey, Mrs. M. K. Frost, C. Gregson, Mrs. B. Guinness, E. Guye, E. F. Haws, J. E. Hobson, C. E. Hudson, Mrs. J. K. Hull, A. A. Kelsey, W. G. Kent, A. Muir, Mrs. W. H. Newman, W. A. Nicholas, Miss E. Penfold, A. W. Pickard, F. W. Preston, A. W. Sowman, Mrs. P. E. Speakman, Miss V. Rivett-Carnac Toyne,

J. Underwood, Miss Wagg, Mrs. E. M. Wale, W. E. Whitnall, Rev. Canon G. B. Wickham, F. R. Wilson, R. Young.

Fellows resident abroad (3).—Ken Asaoka, E. Kampmann, S. M. Machado.

Associate (1).—D. H. Dunn.

Affiliated Societies (3).—Millwall and Cubitt Town Horticultural Society, Williton and District Horticultural Cottage Garden Association, Yorkshire County Allotment Federation.

A lecture was given by Mr. J. Snell, O.B.E., on "The Ormskirk Potato Trials."

GENERAL MEETING.

NOVEMBER 18, 1919.

Rt. Hon. LORD LAMBOURNE, C.V.O., in the Chair.

Fellows elected (29).—F. Baynes, A. F. Booker, W. Boulton, M. Chart, Mrs. D. Churcher, Mrs. Coryton, C. N. Hake, P. J. Hall, Mrs. Hambro, L. J. Harvey, Miss D. R. Helpman, J. W. James, Rev. F. W. Keene, T. Neame, V. Packe, S. M. Price, E. T. B. Reece, Mrs. H. Russell, R. W. Rye, H. Scott, W. H. Scott, Mrs. A. B. Sewell, L. G. Shaw, Mrs. R. C. Slater, A. W. Stiven, C. C. Titchmarsh, L. E. Wareham, R. M. Wood, Major. C. G. Woolner.

Fellows resident abroad (3).—M. K. Bamber, G. Nath Ghose, R. Val Wagener.

Associate (1).—G. H. Heath.

Affiliated Societies (3).—Ascot Horticultural Society, Cape Province Railway Horticultural Society, Earlswood and District Co-operative Society.

GENERAL MEETING.

DECEMBER 2, 1919.

Sir HARRY J. VEITCH, V.M.H., in the Chair.

Fellows elected (63).—Col. Sir H. E. Goold Adams, D. Allan, Miss A. Ashwell, Miss J. Baird, H. Barnard, W. Bartlett, T. S. Beardsmore, H. Becker, Miss A. S. Bridge, R. Buchanan, C. A. Chubb, F. C. Cobb, Miss H. M. Coley, F. J. Collier, Mrs. C. Cotsworth, Major W. G. Coxen, S. F. Curtis, Miss B. D'Avigdor, J. E. Davis, A. A. Dickson, Mrs. Escombe, Miss H. M. Fair, J. Fearn, R. E. Gill, F. Glover, Mrs. G. F. C. Gordon, S. W. Hagen, H. R. Hall, W. F. Herbert, H. Hewitt-Dean, A. H. Hobdell, H. T. Holloway, J. H. Ironmonger, Capt. F. J. Johnstone, J. W. Jones, A. Josephs, H. G. Katte, E. F. King, E. Knott, Rev. F. W. Lane-Claypon, C. B. Leechman, W. S. Livingstone, F. A. B. Lord, Mrs. F. McKinnon, R. H. Mallinson, Miss G. Mawr, W. M. Maynard, Mrs. F. T. Murdock, F. A. Norris, Miss F. E. G. Oldfield, C. Orchard, Rev. C. S. Phillips, H. J. Ponting, M. I. D. Poulter, W. F. Rowles, Mrs. C. Rowntree, J. D. Snowden, R. E. Spender, E. J. Studd, G. Todd, A. Vassall, C. F. Weston, W. H. Woodhouse.

Fellows resident abroad (2).—E. Blackburn, L. Srinwasa Murti.

Associate (1).—Miss M. Watt.

Affiliated Societies (2).—Penrith Allotment Holders' Association, Stapleford and Sandiacre Co-operative Society.

SCIENTIFIC COMMITTEE.

MAY 13, 1919.

Present: Mr. E. A. BOWLES, M.A., F.L.S., V.M.H., in the Chair, and five members present.

Certificate of Appreciation.—A Certificate of Appreciation was unanimously recommended, at the instance of the Orchid Committee, to Messrs. McBean of Cooksbridge for work done in raising the interesting hybrid *Odontoglossum* × *Eugenia*. This plant is the result of crossing *O. cordatum* and *O. crispum*. Its flowers are nearest to *O. crispum*, but the segments are narrowed by the influence of *O. cordatum*, the dull red blotching of which is also shown. The labellum has undergone a curious change, its form being broadly ovate, the acuminate apex of the cordate labellum of *O. cordatum* being suppressed, the only evidence of it being seen in a short thread-like apiculus on the under side of the front of the lip.

Fasciated Saxifrage.—A fasciated stem of *Saxifraga hypnoides* was sent by Mr. Britten of Cuckfield. The stem was fully half an inch in width and bore numerous rather small flowers.

Hybrid Buddleia.—Mr. Van de Weyer sent a specimen of the hybrid *Buddleia globosa* × *B. madagascariensis* which he had raised in his garden at Corfe Castle. While *B. madagascariensis* is only half hardy at Corfe Castle, the hybrid is growing outdoors and flowers earlier than *B. globosa*. It has no scent, as in *B. madagascariensis*, the leaves of which it has also inherited, there being none of the tawny down on the leaves as there is in *B. globosa*, but in the manner of flowering it has followed *B. globosa*, though the flowers are on the whole paler and the balls of flowers rather larger.

SCIENTIFIC COMMITTEE, MAY 20, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and seven members present.

Chinese plants.—Mr. Bowles showed a *Spiraea* with gay foliage and with something of the flowering habit of *S. arguta*, but quite distinct. He also showed Mr. Farrer's fern of *Lonicera syringantha*, a larger-flowered fern than is usually grown. These had both been grown by Mr. Morris at Earlsam.

Kale with foliar enations.—Mr. Bowles showed foliage of a Kale with many enations from the leaves, and these crisped at their edges, so that quite a frill was produced.

Certificate of Appreciation.—The Council had before them plants exhibited, and awarded Certificates of Appreciation to Mr. Magor of Lamellan for work in raising *Rhododendron* × *lepidoboothii* (*lepidotum* × *Boothii*), to Mr. Dykes for raising *Iris stolonifera* × *Korolkowii*, and to Miss Brennand for her paintings of *Rhododendrons*.

Populus lasiocarpa.—A catkin was shown with developing fruits on the same catkin with staminate flowers in lower part, from Mr. C. J. Lucas.

SCIENTIFIC COMMITTEE, MAY 27, 1919.

Mr. E. A. BOWLES, M.A., in the Chair, with three members present, and Mr. G. MARSDEN JONES, visitor.

Hybrid Geums.—Mr. Marsden Jones showed a hybrid between *Geum sibiricum* and *G. bulgaricum* (large-leaved form). The hybrid followed *G. sibiricum* in the main, but had the viscid hairs of *bulgaricum*. Hybrids between *G. rivale* form and *G. coccineum* had leaves mainly of the *rivale* type and open flowers, with colours varying from orange to purplish orange. Eight distinct forms, one of them more or less inclined to doubleness, were found. *Geum bulgaricum* had also been crossed with *Geum coccineum*, and had given a form with foliage near that of *bulgaricum* and attractive flowers. This was a particularly interesting

cross, since it was between flowers belonging to two distinct sections of the genus. These were all sterile.

Narcissus Bulbocodium × *N. 'Emperor.'*—Mr. Marsden Jones also showed photographs of a hybrid raised between *Narcissus Bulbocodium conspicuus* and *Narcissus 'Emperor.'* The plant had leaves seven to nine inches long, and had flowered for the first time this season five years after the cross had been made. The strombium-yellow perianth measured $2\frac{1}{2}$ in. in diameter, and the lemon-chrome trumpet $1\frac{1}{2}$ in. × $1\frac{1}{8}$ in. The latter was much frilled and cut at the mouth, and the perianth segments reflexed somewhat.

Cheiranthus crosses.—Mr. Marsden Jones also brought flowers of a plant resulting from the crossing of *Cheiranthus alpinus* and *C. Allionii*. Those in which the seed parent was *alpinus* had green buds; those where the seed parent was *Allionii* were coloured chestnut. Some flowers showed segregation of the lemon yellow from the orange by flecks and flakes of the former colour in the petals, and in one case flowers of both shades in the same plant.

Mr. Arkwright also brought flowers of *C. Allionii* ♀ × *alpinus* with chestnut-coloured buds. The flowers of this cross were somewhat smaller than in Mr. Marsden Jones's specimens. Neither was fertile, but both are easily raised from cuttings. A Certificate of Appreciation was unanimously recommended to Mr. Marsden Jones.

Prunus Padus.—Mr. Fraser brought specimens of the long-racemed form of *Prunus Padus*, which he said he had not found wild outside gardens in Surrey, although the short-racemed form occurred in that county.

SCIENTIFIC COMMITTEE, JUNE 17, 1919.

Messrs. E. A. BOWLES, M.A., in the Chair, and four members present.

Arabis glabra.—Mr. Marsden Jones sent a specimen of *A. glabra* from Tilston, Cheshire, a new locality for this plant.

Hybrid Narcissus.—He also sent photographs of the bulbs of *N. Bulbocodium* × *N. 'Emperor,'* of which other photographs were shown at the last meeting.

Foliar sepals in Rose.—Mr. C. F. Pratt, of Acton, sent a rose in which the sepals had grown out almost to the size of foliage leaves.

Primula pulverulenta.—Miss Norton, of Dolcorsllwyn Hall, Cemmaes, sent a specimen of *P. pulverulenta* with the note that "Three-years-old plants have about fifteen flower spikes averaging three feet in height, the best half-dozen of which grew to about four feet in height."

Plants causing irritation.—Mr. E. M. Holmes mentioned a case of skin irritation caused by handling the Giant Cow Parsnip, *Heracleum giganteum*. Mr. Bowles also referred to cases of severe skin irritation brought about by handling *Rhus vernicifera*.

Variation of Rose Leaf.—Mr. Holmes showed an interesting example of variegation in the Rose in which one half of a foliage leaf was yellow, the other half green.

SCIENTIFIC COMMITTEE, JULY 1, 1919.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, five members present: Prof. LYTTLE, visitor.

Elm varieties.—Mr. Fraser showed specimens of elms from various localities, commenting upon their characteristics, including *Ulmus stricta*, from Mickleham (with very variable foliage), *U. stricta Whealleyi*, the Jersey elm (which will bear trimming), and *U. minor*, Goodyear's elm.

Eremuri.—Mr. H. J. Elwes showed spikes of a white seedling of *Eremurus Bungei* and a congested form with orange flowers almost sessile upon the rachis. A similarly congested form had occurred among the early-flowering seedlings of *E. himalaicus*.

Cotyledon Pestalozzeae.—Mr. Bowles showed a plant of this form of *C. libanoticus* brought to the meeting by Mr. G. Reuthe. It is almost hardy.

Primula Littoniana malformed.—Mr. Magor sent from St. Tudy some spikes of *P. Littoniana* with bifurcate tips to the inflorescence. It had the same peculiarity on three spikes on one plant.

Gall on Willow.—Mr. Holmes showed some young galls on a willow from Hendon, similar to the large tassell galls several times shown before the Committee.

Variation in variegated elm.—He also drew attention to a communication he had received from a correspondent relative to variations in the degree of whiteness seen on foliage of the variegated common elm. His correspondent, Mr. Lawrence of Henley, had seen in Gloucestershire a tree in a hedgerow which was reported to be perfectly green when the summer was going to be a wet one, but almost white when it was going to be dry. It is well known that this elm varies very much in the degree of variegation, and it is probable that the water supply at critical times has a great deal to do with the amount of whiteness in the foliage, but it is improbable that the variegation is in anticipation of the weather conditions, rather it is dependent upon them.

SCIENTIFIC COMMITTEE, JULY 15, 1919.

Mr. E. A. BOWLES, V.M.H., and five members present.

Virescent Campanula Medium.—Mr. G. Wilson showed a curious form of *Campanula Medium* with a virescent perianth; stamens generally absent but occasionally present, and the style usually more or less developed. Dr. Rendle, who examined the flowers, found also the ovary sometimes normal, but sometimes deformed, and a good number of ovules in all the flowers he examined.

Prolongation of axis in Primula cashmeriana.—Col. Warrender sent an inflorescence of *P. cashmeriana* with a leafy growth at the apex of the flower stem, but with the bracts normal.

Willow galls.—Mr. Fraser showed a number of the tassel galls of the willow in course of development, for comparison with one brought last week by Mr. Holmes.

Teucrium Botrys.—Mr. Fraser also brought specimens of this uncommon plant from Box Hill and Banstead Woods, where it is native. It appears often to be bitten down by rabbits.

Aquilegia with four cotyledons.—Miss M. W. Rogers of Hoyle sent a seedling *Aquilegia* with four cotyledons. She said she often found them with three, but this was the first she had seen with four. "The first rough leaves appear to have been produced in pairs. A tri-cotyledonous carnation produced two whorls of three leaves each, but all the later leaves have come in pairs. Several tri-cotyledonous *Antirrhinums* seem to produce leaves and branches in threes continuously, but the lateral branches, except in one plant, produce opposite leaves. In the exceptional case the two bottom whorls of branches themselves produce leaves in three, but the later branches have leaves in pairs."

SCIENTIFIC COMMITTEE, JULY 29, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and three members present.

Mentha arvensis forms.—Mr. J. Fraser showed dried specimens of a number of forms of *Mentha arvensis* which he had collected in various localities. Some of them appeared to be hybrids between that species and other related ones.

Lycaste Deppei two-flowered.—Miss I. J. Laurie sent a specimen of *Lycaste Deppei* with a two-flowered spike. This condition is very unusual, although it is occasionally seen in some other normally one-flowered species, such as *L. Skinneri*.

Tomato with virescent flowers.—Mr. Stevenson sent a tomato with virescent flowers. The early flowers had been normal and had produced fruit, the later were all alike, virescent and sterile.

Gladiolus Watsonioides.—A *Gladiolus* from Mr. Williams' garden at Llandaff was sent for naming. It proved to be *G. Watsonioides* from Mt. Kenia, figured in the *Bot. Mag.* t. 6919.

Various plants.—Mr. H. J. Elwes sent specimens of *Gerbera Delavayi*, *Roscoea purpurea capitata*, *Campanula amabilis*, and *Alstroemeria Hookeri* from his own garden.

Hybrids of Lathyrus, etc.—Mr. Marsden Jones showed hybrids between *Lathyrus rotundifolius* ♀ × *L. tuberosus* ♂. He had made twelve crosses in July 1915, and obtained three pods, containing ten seeds. Of the seven sown in 1916 all germinated, and one commenced to flower in the same year. There are three types, one with flowers as large as those of *L. rotundifolius*, one with smaller flowers, but larger than *L. tuberosus*. They have flowers with a red-toned salmon standard and pomegranate purple wings, and they are upright in habit like

L. rotundifolius. The third type has rather smaller flowers, darker in colour, and is of a bushy habit. They flower freely from the end of June to mid-September, but the form with bushy habit did not remain in flower so long last year as the others. *L. rotundifolius* started to flower the first week in June and was over by July 8. This year the hybrid began to flower on June 6. *L. tuberosus* is now in full flower. The root-stock of the hybrid is creeping, with sessile tubers, intermediate between the two parents.

Mr. Jones has 17 F₂ seedlings, of which six appear to be of upright habit and four bushy. The others are too small to be sure about.

The seeds of the hybrid were mainly oblong, and of 256, 155 were spotted (60 black with paler spots, 95 light with black spots), the remainder black, whereas in *L. rotundifolius* of 289 seeds, 202 were black, 49 black with light spots, 38 light with black spots.

A Certificate of Appreciation was recommended to Mr. Marsden Jones. Mr. Jones also showed a number of forms of *Centaurea radiata* from various localities in comparison with the normal form of *C. nigra*.

SCIENTIFIC COMMITTEE, AUGUST 12, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair and two members present,
with Mr. L. SMITH, visitor.

Hybrid Pelargoniums.—Mr. Langley Smith showed a series of hybrid Pelargoniums which he had raised, and described their characteristics. He promised to bring them up again at a later date (see p. xcv). A Certificate of Appreciation was unanimously recommended to Mr. Smith.

Currants injured.—Mr. Bowles showed currant cuttings attacked by a subterranean form of aphid, which Mr. Fawcett took for examination (see below).

Red form of Trifolium repens.—He also showed a red-flowered form of *Trifolium repens* from Mr. Van der Weyer.

Bulbils on aerial stems.—Mr. Scrase Dickens sent a *Watsonia* showing bulbils in great quantity at the nodes, and Mr. Cheal an onion with four bulbs on top of a stem under 6 inches in height.

SCIENTIFIC COMMITTEE, AUGUST 26, 1919.

Dr. A. B. RENDLE, M.A., F.R.S., and Mr. HALES present.

Currants injured.—Mr. F. Laing of the British Museum reported as follows upon the currant cuttings taken by Mr. Fawcett: "The aphid on the roots of the currant is the root form of one which curls the leaves of elms (*Schizoneura ulmi*). It was originally described by Buckton as *S. fodiens*, but the migration between the elm and *Ribes* has since been established. The root form sometimes causes considerable damage to the roots of young *Ribes* plants, causing them to split.

"The aphid on the roots is known as *Myzus ribis* Linn. It causes the leaves to assume a puffy red appearance, the leaves ultimately withering. It is very prevalent this year. Quite recently (two months ago) Miss Haviland published a paper on its life-history, wherein she maintains that this species migrates to dead nettles, and has hitherto been known as *Phorodon galeopsidis* Kalt. This, however, will probably require confirmation. Up till the appearance of this paper it was not known what became of *M. ribis* in the late summer."

SCIENTIFIC COMMITTEE, SEPTEMBER 9, 1919.

Dr. A. J. VOELCKER, M.A., in the Chair, Mr. HALES, and Mr. STANBURY, visitor.

Stereum purpureum.—Mr. Stanbury exhibited forms of *Stereum* which he had found growing on the stems of plum and Portugal laurel.

Buds on leaves.—Mr. Hales showed specimens of tomato plants bearing adventitious buds upon the leaves.

Poppy with short stamens.—Mr. Hales also showed a flower of *Papaver orientale*

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in which the stamens were very short, so that it had the appearance of a Japanese Anemone.

Pyrola rotundifolia.—Rev. W. Wilks exhibited a specimen of *Pyrola rotundifolia* from his garden at Shirley, Croydon.

SCIENTIFIC COMMITTEE, SEPTEMBER 23, 1919.

Mr. E. A. BOWLES, M.A., in the Chair, and four members present.

Apples diseased.—Mr. Bowles exhibited apples, 'Warner's King' and 'Winter Hawthornden,' affected with brown spots in the flesh. The brown spotting of soft-fleshed apples some little distance beneath the skin is due to some physiological cause, and is known as "bitter-pit."

Mosaic disease of beans.—Mr. A. D. Cotton sent a note with specimens of beans, 'Black Valentine' and 'Étampes Early White,' showing the disease of beans called "mosaic." These were growing in the gardens of the Royal Horticultural Society at Wisley from American and French seeds. He wrote: "In slight cases the only symptoms are mottled and crinkled leaves, but in bad cases the leaves are much reduced in size and the whole plant stunted, while the yield is greatly reduced. In extreme cases practically no crop is produced. A good deal of work has been carried out on Bean mosaic in America, and it is clear that the disease is transmitted through the seed. It is also infectious if sap from diseased plants is introduced into healthy plants. It is possible, therefore, that insects may be responsible for spreading the disease. With regard to varieties many kinds of beans are subject to mosaic, especially amongst the dwarf forms; some, however, are quite immune, e.g. 'China Red Eye,' 'Detroit,' 'Arlington Red,' 'Cranberry'."

As the disease is transmitted through the seed, it is most important to save seed from healthy plants only.

SCIENTIFIC COMMITTEE, OCTOBER 21, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and five members present.

Albino Ononis, etc.—Mr. J. Fraser brought an albino *Ononis spinosa*, a proliferous state of *Festuca elatior arundinacea*, which he believed was due to galling by insects; specimens of *Medicago falcata*, which was at one time confined to the Eastern counties, but which has now become established in many places on the banks of the Thames in Surrey, and also in Middlesex. He regarded these plants as new importations from the Continent.

Stereum purpureum.—Mr. Fielder sent a piece of stem of plum from Bromley, Kent, showing the fructifications of *S. purpureum*. One half of an adjoining plum tree was dead, and all the leaves on the remaining half were diseased. Two other plums, all within 20 feet of each other and the above, were dead, and one other dead tree had already been cut down. He said: "The undersides of the branches were covered with the fungus."

SCIENTIFIC COMMITTEE, NOVEMBER 4, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and three members present.

The only thing before the Committee was a seedling *Abies* for naming.

SCIENTIFIC COMMITTEE, NOVEMBER 18, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and six members present.

Effect of drought upon plants.—Mr. J. Fraser showed a series of potatoes, kohlrabi, and French bean-seeds to illustrate the effect upon them of the drought. They all showed splitting, and this was apparently due to cessation of growth caused by the drought, followed by wet causing swelling beyond the capacity of the skin to keep pace with.

One or two plants were sent for naming.

SCIENTIFIC COMMITTEE, DECEMBER 2, 1919.

Present: Mr. E. A. BOWLES, M.A., F.L.S., V.M.H. (in the Chair); Dr. A. B. Rendle, Dr. W. Bateson, Messrs. J. Fraser, W. Hales, W. Fawcett, F. J. C. Chittenden (hon. sec.), Messrs. Langley Smith and Crane, visitors.

White-seeded Beans.—Dr. Rendle showed, on behalf of Mr. Spencer of Chobham, a series of runner beans. A white-seeded form, and several varieties between that and the ordinary black-and-purple form, had appeared some years ago, and Mr. Spencer had selected each year the white form until now almost all the plants gave white seeds only. The original culture had probably contained a heterozygous plant, and possibly also crossing had occurred to a greater or less extent each season with a purplish form.

Hybrid Pelargoniums.—Mr. Langley Smith of Catford showed a series of hybrid Pelargonium species with the object of illustrating inheritance of leaf-cutting, purple-veining, variegation, etc., and a number of *Antirrhinum* seedlings to illustrate the means of roguing, well known to many growers, in the seedling state, where the colours of the under-epidermis are a guide as to the white, coloured or streaked nature of the flowers.

He sent the following notes with them:

Variegation as a Heritable Character.

1. Further Notes on the Inheritance of Variegation in Pelargoniums. *A. P. denticulatum* × *P. filicifolium* (Sets A, B, and C, 5/1/16).

Variegation has, in this instance, developed in the course of experiments in hybridisation, and has definitely proved itself to be a heritable character.

Of the samples of sets A, B and C, exhibited on 5/1/16 to the R.H.S. Scientific Committee, the report says "The variegation was, as a rule, but poorly marked, and in many took the form of a very narrow whitish line round the margin of the leaf."

Seedlings, F₂ Generation.

F ₂ Breeding Number	Variegated	Not Variegated
Set A 14	5	6
Set C 15	4	3
Set B 16	1	6
Set A 17	7	1
Set B 18	5	3
	22	19
	—	—

Doubt has been thrown on the hardness of these variegated seedlings as compared with the non-variegated.

During the spring of 1919, very severe weather was experienced, and on three successive nights 6 degrees of frost were registered in the greenhouse in which the plants were. This proved fatal to many Zonales, all the *Tomentosum* section, many of the *Citriodora* section, as well as *P. diadematum*, *P. Vandesii*, *P. Blandfordianum*, *P. capitatum*, *P. Radula*, *P.* × '*Clorinda*,' '*M. Nonin*,' and all the 'Show' and 'Fancy' varieties.

Of the section exhibited, however, the following survived the ordeal:

Breeding No.	Variegated	Not Variegated
14	4	2
15	2	3
16	1	5
17	5	1
18	3	1

B. Inheritance of dark veining: F₁. *P.* 'Cataract' (*P. Radula* × *P. denticulatum*), no dark veining. F₂. *P.* 'Cataract A' (*P.* × 'Cataract' × *P. denticulatum* seedling 2), dark veins. F₃. 2 Seedlings (*P.* × 'Cataract A' × *P. denticulatum* seedling 2), one dark veins, one not.

C. Inheritance of dark foliage: *P. zonale* 'Black Vesuvius' selfed. 7 seedlings, 6 dark foliage, 1 green foliage; 2 dark seedlings = 'Black Vesuvius'; 1 dark seedling, salmon flower; green-leaf seedling, dark-red flower.

2. *Variegation in Antirrhinums.* The seeds were saved from 9 capsules of seed of an *Antirrhinum* with 'striped' flowers. The seeds were thoroughly mixed together before sowing.

753 seedlings were raised with the following results: White-flowered, 490; Red-flowered, 198; Striped, 65.

These were judged by the appearance of the cotyledons and the first two or three pairs of true leaves.

The back of the cotyledons and leaves in the case of white varieties was green, in the case of red varieties was more or less red in colour, and in the case of striped varieties, was green marked with reddish stripes and dots.

The number of striped varieties may be slightly larger, as some of the blooms of white varieties are only slightly speckled with red, and the marking on the leaves was indistinguishable.

Further investigation shows that the stems of the older plants of 'striped' varieties are 'striped' with red colour. The sepals and seed capsules are spotted with reddish marks; but, as a rule, the leaves do not retain their early distinctiveness.

Some of the 'red' varieties have self-red blooms, while others have a white tube to the corolla. The proportion of plain red to red-and-white has not been determined. It is probable that the original plant was cross-fertilized by insects with white, red, and red-and-white *Antirrhinums* growing near.

Further experiments with regard to the inheritance of variegation of this kind in *Antirrhinums* has been tried with segregated plants this summer.

3. *Variegation in Sweet Peas.* This occurs occasionally and is heritable.

A plant raised from an old variety—'Duchess of Westminster'—had yellow leaves. This was very delicate and only produced 1 pod of 3 seeds. All the plants from these seeds were also yellow-leaved, but still more delicate than the F_1 generation. Only one plant flowered and 7 seeds were saved, of which 4 germinated; 3 of the resulting plants had yellow leaves, and the fourth had variegated leaves. All died without producing seed.

Pelargoniums—Leaf variation under hybridization.

1. 'Catact' F_1 .—Leaf resembles *Radula* ($P. Radula \times P. denticulatum$); 'Catact' $\times denticulatum$ F_2 .—Leaves intermediate, but nearer *Radula*; ('Catact' $\times denticulatum$) $\times denticulatum$ F_3 .—One resembles *Radula*, one resembles *denticulatum*.

2. *Denticulatum* $\times filicifolium$ — F_1 .—Leaves resembled *denticulatum*.

Do. selfed.— F_2 3; Sections A, B, C.

A resembled *denticulatum*, B were intermediate, C resembled *filicifolium*.

F_3 { Set A resemble *denticulatum*, some even coarser cut.

{ Set B all intermediate, but nearer *denticulatum*.

{ Set C, seven nearer *filicifolium*, one resembles *denticulatum*.

A unanimous vote of thanks was accorded to Mr. Smith for his exhibit.

Seedlings of Victoria Plum.—Mr. M. B. Crane, on behalf of the John Innes Horticultural Institution, showed coloured drawings of a long series of fruits and seedlings raised from selfed flowers of the Plum 'Victoria.' The variation in the size, colour, and form of the fruit was extraordinary, some being as small as bullace and deep purple, others yellow and as large almost as 'Victoria.' The variation in the form of the foliage was equally great. In some seedlings the bark was smooth, and in others much split. Some of the seedlings are self-fertile, others self-sterile. The Plum Victoria is thus apparently heterozygous for almost all characters. The Committee, to mark their appreciation of the excellence of the illustrative pictures, unanimously recommended the award of a Certificate of Appreciation to Mr. C. H. Osterstock, Enderley, Watery Lane, Merton Park, S.W.

FRUIT AND VEGETABLE COMMITTEE.

MAY 13, 1919.

Mr. C. G. A. Nix in the Chair, and thirteen members present.

No awards were recommended on this occasion.

Exhibits.

S. Harrington, Esq., Witham : Onion 'Giant Zittau.'
 Rev. W. Wilks, V.M.H., Shirley : Rhubarb 'Tobolsk.'

FRUIT AND VEGETABLE COMMITTEE, MAY 20, 1919.

AT CHELSEA.

Mr. C. G. A. Nix in the Chair, and nineteen members present.

No awards were recommended on this occasion.

Exhibit.

Mr. Hancock, Mansfield : Rhubarb.

FRUIT AND VEGETABLE COMMITTEE, MAY 27, 1919.

Rev. W. WILKS, M.A., V.M.H., in the Chair, and five members present.

There were no exhibits before the Committee on this occasion.

FRUIT AND VEGETABLE COMMITTEE, JUNE 17, 1919.

Mr. W. POUPART in the Chair, and fifteen members present.

The following awards recommended by the visiting Sub-Committee to Cabbage Lettuces on trial at Wisley were confirmed:

Award of Merit.

No. 156. 'All the Year Round,' from Messrs. Sutton.

{ Nos. 70, 267. 'Continuity,' from Messrs. Morse and Messrs. Nutting.

{ No. 76. 'Satisfaction,' from Messrs. Sutton.

These are considered to be identical.

No. 12. 'Georges,' sent by Messrs. Barr.

No. 87. 'Market Favourite,' sent by Messrs. Watkins & Simpson.

No. 21. 'Tender and True,' sent by Messrs. Barr.

No. 121. 'Wayahead,' sent by Messrs. Barr.

Highly Commended.

No. 13. 'Golden Beauty,' from Messrs. Barr.

Nos. 14, 15, and 16. 'Early Curled Simpson,' from Messrs. Burpee, Messrs. Thorburn and Messrs. Morse.

No. 17. 'Australian,' from Messrs. Thorburn.

Nos. 18-20. 'Black-Seeded Simpson,' from Messrs. Morse, Messrs. Thorburn, and Messrs. Burpee.

No. 189. 'Commodore Nutt,' from Messrs. Sutton.

No. 8. 'Harbinger,' forcing from Messrs. Barr.

No. 107. 'May King,' from Messrs. Thorburn.

{ No. 26. 'New York,' from Messrs. Thorburn.

{ No. 263. 'Wonderful,' from Messrs. Nutting.

These are considered to be identical.

(For descriptions and notes see Report, p. 334.)

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Other Exhibit.

J. Chivers, Esq., Cambridge: Strawberry 'Crimson Beauty.'

FRUIT AND VEGETABLE COMMITTEE, JULY 1, 1919.

Mr. C. G. A. NIX in the Chair, and nine members present.

Award Recommended:—

Cultural Commendation.

To Messrs. Rochford, Broxbourne, for Tomato 'Ailsa Craig Improved.'

Other Exhibits.

Messrs. Chapman, Rye: Tomato 'Orange Sunrise.'

Mr. S. Mortimer, Farnham: Cucumbers.

Mr. G. H. Mould, Ambleside: seedling Strawberry.

Mr. Payne, East Grinstead: Tomato.

FRUIT AND VEGETABLE COMMITTEE, JULY 15, 1919.

Mr. C. G. A. NIX in the Chair, and thirteen members present.

Award Recommended:—

Gold Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for vegetables.

Other Exhibits.

Mr. H. Close, Orpington: Currant 'Littlecroft Beauty.'

Mr. A. J. Morgan, Devoran: seedling Raspberry.

Mr. G. H. Mould, Ambleside: seedling Strawberry.

FRUIT AND VEGETABLE COMMITTEE, JULY 29, 1919.

Mr. C. G. A. NIX in the Chair, and eleven members present.

Award Recommended:—

First-class Certificate.

To Gooseberry 'Howard's Lancer' (votes unanimous), from the Earl of Strafford (gr. Mr. Markham), Barnet. This is a very old variety with large fruits, oval in shape, greenish-white in colour, and of very good flavour. The bush is an enormous bearer, and needs liberal feeding to maintain its fertility.

Other Exhibits.

Messrs. Cannell, Eynsford: Gooseberry 'Ben Smith' and Raspberry 'Alcock.'

R.H.S. Gardens, Wisley: *Rubus biflorus quinqueflorus*.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 12, 1919.

Mr. C. G. A. NIX in the Chair, and thirteen members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Bunyard, Maidstone, for fruit.

The following awards recommended by the Sub-Committee to Summer Raspberries on trial at Wisley were confirmed:—

Award of Merit.

No. 29, 'Golden Hornet,' sent by Mr. G. Trinder, Fleet, Hants.

No. 12, 'Park Lane,' sent by Mr. P. H. Cousens, Swanwick, near Southampton

Highly Commended.

No. 2, 'Brown's Excelsior' (for flavour), sent by Mr. G. Brown, Thorngumbald, Hull.

Commended.

Nos. 9 & 10, 'Hornet,' sent by Messrs. Paul, Cheshunt, and Mr. Cousens.

No. 41, 'Lloyd George,' sent by Mr. J. J. Kettle, Corfe Mullen, Dorset.

Nos. 13 & 14, 'Profusion,' sent by Messrs. Bunyard, Maidstone, and Mr. Cousens.

Nos. 16 & 17, 'Pyne's Royal,' sent by Mr. Cousens and Mr. Allgrove, Slough.

No. 36, 'Laxton's Prolific,' sent by Messrs. Laxton, Bedford.

Other Exhibits.

Mr. S. Mortimer, Farnham : Cucumber 'Cynosure.'

Mr. F. Woollard, Brighton : Apple 'Early Wonder.'

FRUIT AND VEGETABLE COMMITTEE, AUGUST 26, 1919.

Mr. W. POUPART in the Chair, and sixteen members present.

Awards Recommended :—*Gold Medal.*

To J. Nix, Esq. (gr. Mr. E. Neal), Crawley, for fruit.

Silver Knightian Medal.

To Messrs. Bunyard, Maidstone, for fruit.

Silver Banksian Medal.

To Sir Albert Rollit, Chertsey, for outdoor Figs.

Award of Merit.

To Apple 'Laxton's Superb' (votes unanimous), from Messrs. Laxton, Bedford. Fruit of medium size, round, inclined to be conical, colour green, deeply flushed on the exposed side with a dull red, and dotted with green spots showing through the red colour. Eye closed, set in a rather shallow and slightly puckered basin. Stalk thick and fleshy, very short and set in a shallow cavity. Flesh crisp, and of excellent flavour. This variety was raised from Cox's Orange Pippin, crossed with Wyken Pippin, and should be an acquisition to late dessert apples, keeping well to February or March. The Sub-Committee who inspected the fruiting tree reported that the tree was a good grower and bearing a heavy crop of fruit (Fig. 69).

To Plum 'Laxton's Gage' (votes 9 for, 4 against), from Messrs. Laxton, Bedford. Raised from the old Green Gage crossed with Victoria. Fruit, rather small, roundish oval in shape, skin pale yellow, mottled with a deeper yellow. Stalk nearly an inch long, and rather deeply inserted. Flesh very melting, full of juice and of first-rate flavour.

The following awards recommended by Sub-Committees at Wisley to varieties of Dwarf Beans and Parsley on trial at Wisley were confirmed :—

DWARF BEANS.

Award of Merit.

13, 14, 'Sunrise,' sent by Messrs. Carter and Barr; 22 to 27, 'Masterpiece,' sent by Messrs. Dickson, Dickson & Robinson, Simpson, Sydenham, Sutton, Watkins & Simpson; 45, 'Reselected Longsword,' sent by Messrs. Carter; 46, 47, 'Reliance,' sent by Messrs. Sutton and Barr; 48, 'Fillbasket,' sent by Messrs. Barr. (Nos. 45, 46, 47, and 48 are considered not sufficiently distinct from 'Masterpiece.') 41, 'Bounteous,' sent by Messrs. Watkins & Simpson; 43, 44, 'Perpetual,' sent by Messrs. Barr and Carter. (The Committee regard Nos. 41, 43, and 44 as identical.) 66, 'The Shah,' sent by Messrs. Barr; 68, 69, 252, 'Superlative,' sent by Messrs. Sutton, Barr, and Nutting; 70, 71, 'Magpie,' sent by Messrs. Carter and Barr; 75, 'Métis,' sent by R.H.S. Wisley; 76, 'Black Prince,' sent by Messrs. Barr. (The Committee regard Nos. 68, 69, 70, 71, 75, 76, and 252 as identical.) 73, 'Prodigious,' sent by Messrs. Carter; 74, 'Feltham Prolific,' sent by Messrs.

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Watkins & Simpson. (*The Committee regard Nos. 73 and 74 as identical.*) 88, 'White Haricot,' sent by Messrs. Sutton; 89, 'White Leviathan,' sent by Messrs. Watkins & Simpson; 96, 'Dunkin's Dwarf,' sent by Mr. Dunkin. (*The Committee regard Nos. 88, 89, and 96 as identical.*) 125, 'Evergreen,' sent by Messrs. Sutton; 143, 251, 'Earliest of All,' sent by Messrs. Watkins & Simpson, and Nutting; 145, 'Fifty Days,' sent by Messrs. Carter; 149, 'Early Mohawk,' sent by Messrs. Morse; 175, 'Satisfaction,' sent by Messrs. Sutton; 176, 'Early Wonder,' sent by Messrs. Carter; 186, 'Improved White Wax,' sent by Messrs. Carter.

Highly Commended.

35, 'Bountiful,' sent by Messrs. Webb; 36, 'The Sorsby,' sent by Messrs. Dickson, Brown, and Tait; 37, 'Haricot nain Gloire de Saint André,' sent by Messrs. Cooper Taber; 38, 'Guernsey Wizard,' sent by Mr. Warry; 39, 'Nain de Perreux,' sent by R.H.S. Wisley; 40, 'Excelsior,' sent by Messrs. Barr. (*The Committee regard Nos. 35, 36, 37, 38, 39, and 40 as nearly allied, but not quite identical.*) 50, 'Prolific Negro,' sent by Messrs. Sutton; 54, 'Black Hermitage,' sent by Messrs. Barr; 151, 'Suisse Gris,' sent by R.H.S. Wisley; 158, 159, 161, 'Canadian Wonder,' sent by Messrs. Sutton, Carter, and Dobbie.

(For descriptions see Reports on Wisley Trials, p. 316.)

PARSLEY.

First-class Certificate.

No. 27, 'Perennial Moss Curled,' sent by Messrs. Watkins & Simpson.

Award of Merit.

No. 43, 'Moss Curled,' sent by Messrs. Nutting.

No. 35, 'Perfection Moss Curled,' sent by Messrs. Barr.

No. 36, 'Imperial Curled,' sent by Messrs. Barr.

Highly Commended.

No. 5, 'Fern Leaved Extra Curled,' sent by Messrs. Watkins & Simpson.

No. 7, 'Fern Leaved,' sent by Messrs. Barr.

(For description see Reports on Wisley Trials.)

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 9, 1919.

Mr. C. G. A. NIX in the Chair, and fourteen members present.

Award Recommended :—

Silver Banksian Medal.

To Sir Albert Rollit, Chertsey, for outdoor Figs.

Other Exhibits.

Mr. V. Banks, London: Plums bottled by sulphur-fume method.

Messrs. Bunyard, Maidstone: fruit.

Mr. A. W. Chillery, Exmouth: Apple 'Marpool Beauty.'

Messrs. Laxton, Bedford: new Apples.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 23, 1919.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver-gilt Hogg Medal.

To Messrs. Rivers, Sawbridgeworth, for fruit trees in pots.

Silver-gilt Knightian Medal.

To Messrs. Dickson & Robinson, Manchester, for Onions.

Silver-gilt Banksian Medal.

To Messrs. Bunyard, Maidstone, for fruit.

Silver Knightian Medal.

Messrs. Laxton, Bedford, for fruit.

Messrs. Sutton, Reading, for Beans.

Award of Merit.

To Apple 'Welford Beauty' (votes unanimous), from Mr. W. Pope, Newbury. Fruit rather over medium size, roundish ovate, even and regular in outline, skin greenish yellow and streaked with red on the sunny side. Eye large and partly closed with curled segments, set in a wide and shallow basin with five slight ridges near the eye. Stalk thin, nearly an inch long, set in a very deep cavity; flesh white, very juicy, tender, crisp, and of very good flavour. The tree is stated to be a good grower and free bearer. A very handsome and promising variety (Fig. 71).

Other Exhibits.

Mr. H. L. Brown, Kingskerswell : Apple 'Barton Hall.'

Mr. W. R. Cox, Islip : Apples.

Mr. G. E. Dyke, Milborne Port : Apples.

Mr. W. H. Honess, Lymington : Marrow 'Walhampton Attraction.'

Mr. C. Turner, Slough : Crab Apples.

Mr. F. Vizard, Cheltenham : seedling Pear.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 21, 1919.

BRITISH FRUIT SHOW.

Mr. C. G. A. Nix in the Chair, and twenty-two members present.

Awards Recommended:—*Gold Medal.*

To E. A. Cain, Esq. (gr. Mr. T. Pateman), Welwyn, for fruit.

Silver gilt Knightian Medal.

To Messrs. Cheal, Crawley, for fruit.

To Knebworth and District Horticultural Society (Sec. Mr. C. H. Sands), for fruit.

Silver Knightian Medal.

To Messrs. Lane, Berkhamstead, for fruit.

Bronze Banksian Medal.

To Lee Common School Gardens, for Apples.

Award of Merit.

To Apple 'Queen Mary' (votes unanimous), from Mr. E. J. Parsons, Worcester. This variety was raised by the exhibitor and is the result of a cross between 'James Grieve' and 'William Crump.' The fruit is of medium size, conical, even in outline, skin pale yellow but deeply flushed with red on the exposed side. The eye is small, closed, and set in a very shallow basin. Stalk thin, set in a rather deep cavity; flesh very tender, crisp, juicy, and of excellent flavour. A very good dessert variety for use during October and November, somewhat resembling 'American Mother' (Fig. 70).

Other Exhibits.

Messrs. Bath, Wisbech : Plum 'Jewson Marvellous.'

Mr. Bibby, Shrewsbury : Apple 'Hardwick Seedling.'

Mr. Charrington, Limsfield : seedling Apple.

Mr. Close, Orpington : seedling Gage.

Mr. Cox, Islip : seedling Apples.

Mr. Perry, Yeovil : Apple 'St. Ivel Pippin.'

Mr. Saward, Panshanger : Apple 'Vincent.'

Swanley Horticultural College : Apples.

Mr. A. W. Sutton : Apple 'William Jennings.'

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FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 4, 1919.

Mr. E. A. BUNYARD in the Chair, and ten members present.

Awards Recommended :—

Gold Medal.

To Messrs. Barr, Taplow, for vegetables.

To J. A. Nix, Esq., Crawley, for fruit.

Silver-gilt Knightian Medal.

To the Board of Agriculture, Ormskirk, for Potatos.

Silver-gilt Banksian Medal.

To Messrs. J. & W. Birch, Sefton, for Potatos.

Award of Merit.

To Raspberry 'Lloyd George' (votes unanimous), from Mr. J. J. Kettle, Corfe Mullen. For description of this variety see report on Raspberries tried at Wisley.

The following awards to autumn-fruiting Raspberries, recommended by Sub-Committees visiting Wisley during September and October, were confirmed.

Award of Merit.

No. 2, 'Queen Alexandra,' from Mr. P. H. Cousens, Swanwick, Southampton.

No. 7, 'Perpetual Superlative,' from Mr. P. H. Cousens.

No. 8, 'Souvenir de Désiré Bruncau,' from Mr. P. H. Cousens.

Nos. 9 & 10, 'Surprise d'Automne,' from Messrs. G. Bunyard, Maidstone, and P. H. Cousens.

Highly Commended.

No. 3, 'Dann's Monarch' or 'Hailshamberry,' from Mr. P. H. Cousens.

No. 4, 'November Abundance,' from Mr. P. H. Cousens and Mr. J. C. Allgrove, Middle Green Nursery, Langley, Slough.

Commended.

No. 14 'Wisley Autumn Fruiting' from R.H.S. Gardens, Wisley.

Other Exhibits.

Messrs. Ireland & Hitchcock, Marks Tey : Apple 'Mascott.'

Mr. W. G. Moore, Kensington : Marrows, Gourds, and Apples.

Capt. R. Rogers, Cornwall : Apples.

Rev. E. Stogdon, Watford : Parsnips.

Lady Thornycroft, Bembridge : Apple 'Edith.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 18, 1919.

Mr. C. G. A. NIX in the Chair, and fifteen members present.

Awards Recommended :—

Gold Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for fruit.

To Messrs. Sutton, Reading, for Potatos.

Silver-gilt Hogg Medal.

To Mr. W. H. Page, Hampton, for Apples (Cox's Orange Pippin).

Silver-gilt Knightian Medal.

To Messrs. Whitclegg, Chislehurst, for fruit.

Subject to the trees being inspected in fruit and approved by a Sub-Committee next year, Awards of Merit were recommended to Apple 'Fugglestone Pippin' from A. Farebrother, Esq., Wilton, and to Apple 'Tythby Seedling' from Messrs. Chivers, Cambridge.

Other Exhibits.

Mr. T. Coomber, Monmouth : Apple ' Thomas Coomber.'
Mrs. Drake, Stroud : Apple ' Queen of the Pippins.'
Mr. A. Faulkner, Wem : Apple ' Faulkner's Seedling.'
Lady le Marchant, Woking : Apple ' Crofton Scarlet.'
Mr. W. Mason, Barkway : Apples.
R.H.S. Gardens, Wisley : Potatos.
Mr. G. Rubython, Farnborough : Apple ' Shirley Pippin.'
Mr. W. Walton, Brighton : Apples.
Messrs. White, Worcester : Apple ' White's Victory.'
Rev. W. Wilks, M.A., V.M.H., Shirley : Apple ' Evargil.'

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 2, 1919.

Mr. C. G. A. Nix in the Chair, and fourteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. T. Collister, Bembridge : Apple ' Sir Douglas Haig.'
Mr. W. Martin, Exeter : Apples.
Mrs. Miller, Marlow : preserves.
Mr. G. Pyne, Topsham : Apple ' Orotava.'
Messrs. Westmacott, London : South African-preserves.

FLORAL COMMITTEE.

MAY 13, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. E. J. Hicks, Twyford, for Roses.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for flowering trees and shrubs.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Bronze Flora Medal.

To Messrs. Reamsbottom, Geashill, for Anemones.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Mr. C. Elliott, Stevenage, for hardy plants.

To Mr. G. W. Miller, Wisbech, for hardy plants.

Award of Merit.

To *Primula Auricula Obristii* (votes unanimous), from Mr. T. Temple West, Redhill. A beautiful clear yellow Auricula with large flowers borne in a bold truss.

To *Ramondia Natallae alba* (votes 17 for), from Mr. T. Temple West, Redhill. A very pure white form of this well-known rock-garden plant.

To *Rhododendron Gullii* (votes 17 for), from Messrs. Gill, Falmouth. This very fine bright carmine-red Rhododendron is the result of a cross between *R. Aucklandii* and *R. Thomsonii*. The flowers are large, widely open and are borne in trusses of 8 to 12. The tube is somewhat paler than the rest of the flower.

To *Trifolium uniflorum* (votes unanimous), from Mr. W. Wells, Junr, Merst ham. A neat trailing plant from Italy and Greece and other parts of Europe. The pink and white flowers are axillary, solitary and on short peduncles studded profusely over the plant. The leaves are prettily marked and have long petioles.

Other Exhibits.

Messrs. Buffard and Patrick, Ditchling : *Primula obconica*.

Mr. A. G. Gentle, Colchester : *Hippeastrum* 'George Gentle.'

A. Grove, Esq., Henley : *Moraea spathacea*. F.C.C., 1878.

Misses Hopkins, Shepperton : hardy plants.

Rev. J. H. Pemberton, Romford : Roses.

Messrs. Smith, Guernsey : Rhododendrons.

Messrs. Tucker, Oxford : *Daphne petraea grandiflora*. A.M., 1918.

Messrs. W. S. Watney, Bexley Heath : Geranium 'Victory.'

FLORAL COMMITTEE, MAY 20, 1919.

AT CHELSEA.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-members present.

Awards Recommended :—

First-class Certificate.

To *Paeonia Willmottiana* (votes unanimous), from Miss E. Willmott, V.M.H., Great Warley. A new herbaceous species from China growing about 2½ feet high. The flowers are about 6 inches across and pure white. The prominent

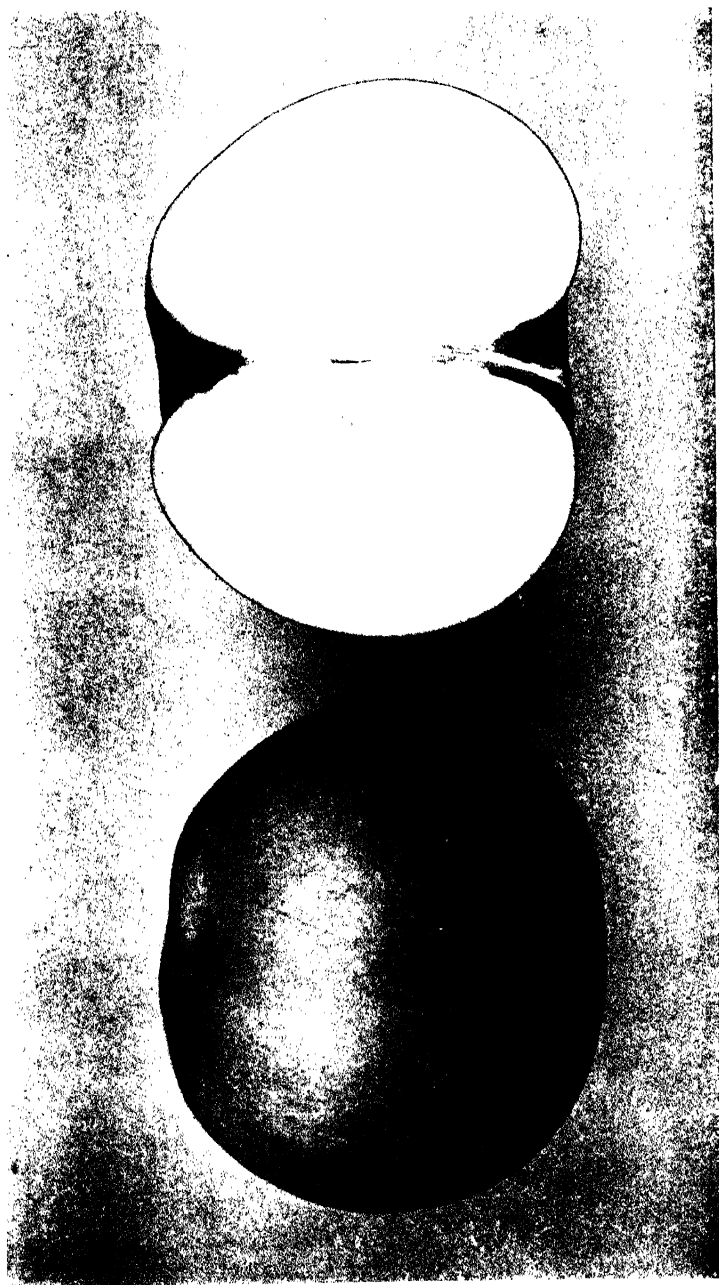


FIG. 69.—APPLE 'LAXTON'S SUGAR'
(slightly reduced)
(p. xcix).

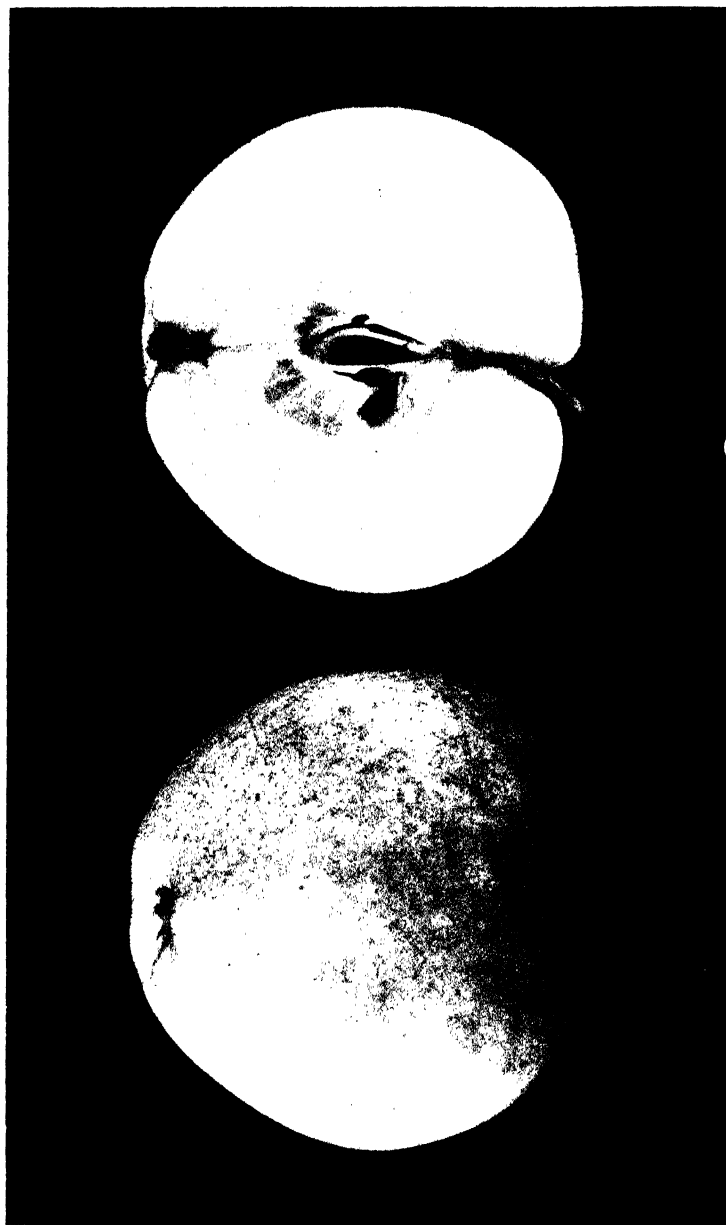


FIG. 70.—APPLE 'QUEEN-MARY'
(slightly reduced)
(p. cit.)

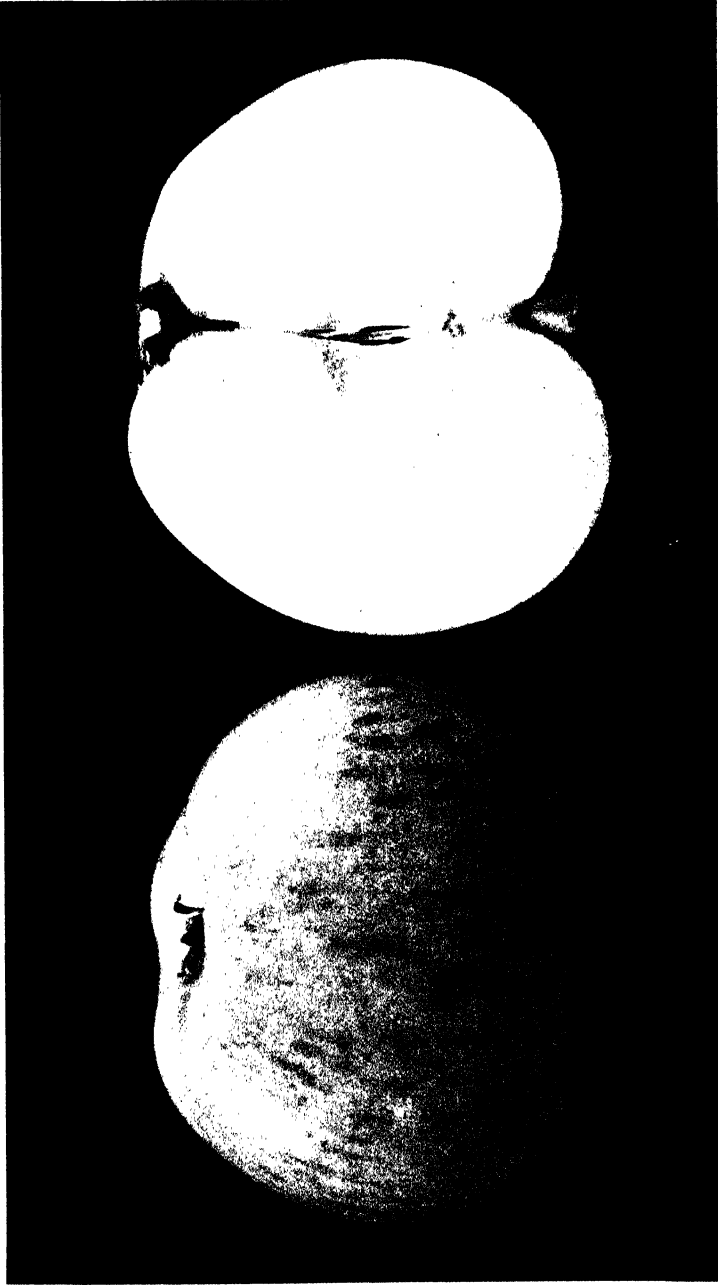


FIG. 71.—APPLE 'WELFORD BEAUTY'
(slightly reduced)
(p. ci).

red-tipped stigmas push through a cluster of stamens, the filaments being crimson and the anthers golden yellow. The handsome foliage is deep green above, and covered with a thick down on the under surface.

Award of Merit.

To Carnation 'Cleopatra' (votes 10 for, 1 against), from Mr. J. Douglas, Great Bookham. A very fine Border variety of excellent form. The blooms are clear old-rose colour and are carried on strong wiry stems.

To Carnation 'Saffron' (votes 10 for), from Mr. C. Engelmann, Saffron Walden. A good clear yellow perpetual-flowering variety with non-bursting calyces and strong wiry stems of good length.

To Geranium 'Whiteknights Glory' (votes 10 for), from Mr. F. Bright, Whiteknights, Reading. A handsome zonal Pelargonium bearing large trusses of well-formed orange-salmon flowers. This variety should be very valuable for summer bedding.

To *Iris Hoogiana* (votes 12 for), from W. R. Dykes, Esq., M.A., Godalming. A new Turkestan species belonging to the *Regelia* section. It is very hardy, for it does not reappear above the ground until some weeks after *I. Korolkowi* and *I. stolonifera*, to which it is nearly allied. *Iris Hoogiana* grows to a height of 2½ to 3 feet, and each stem produces two or three flowers. The colour of the flowers is a beautiful shade of blue—almost sky-blue. The falls are slightly deeper in colour and the golden yellow beard adds greatly to the beauty of the flower.

To *Iris 'Turkoman'* (votes 7 for, 2 against), from W. R. Dykes, Esq., M.A., Godalming. This is a very free-flowering *Iris*. It is hybrid of *I. Korolkowi* and *I. stolonifera*. The flowers are of medium size, and have the standards bluntly pointed, and the tips of the falls rounded. The colour is a striking shade of bronze veined with bluish purple, while the conspicuous beard is of a very bright blue shade.

To *Menziesia multiflora major* (votes 8 for, 1 against), from Mr. G. Reuthe, Keston. This is a synonym of *M. ciliicalyx*, and is a new species from Korea. This charming hardy plant has bell-shaped flowers of a pink shade outside, white inside, and the reflexed segments of a wine-red colour. The stamens are crimson. The foliage is light green, and becomes a beautiful red tint in the autumn.

To Pink 'Model' (votes 10 for, 2 against), from Mr. C. H. Herbert, Birmingham. A beautiful garden Pink, producing perfect flowers of a clear pink colour with crimson markings at the base.

To Pink 'Queen Mary' (votes 14 for), from Mr. C. H. Herbert, Birmingham. This variety has large flowers of a deep rose-pink colour, with maroon-crimson markings at the base of the petals. The margins of the petals are slightly fringed.

To *Primula Cooperi* (votes 9 for), from Messrs. Bees, Liverpool. This *Primula* is of tufted growth, and produces spikes carrying large clusters of deep violet-purple flowers, somewhat deeper in colour round the eye. The individual blooms are about ½ inch across. The leaves are long, lanceolate, with finely serrated margins and mealy underneath. The plant grows about 1 foot high, and is said to be quite hardy.

To *Rhododendron lepidoboothii* (votes 6 for), from E. J. P. Magor, Esq., St. Tudy, R.S.O., Cornwall. This plant is the result of a cross made in 1915, between *R. lepidotum* and *R. Boothii*, the latter being the pollen parent. It is a vigorous and apparently hardy plant with a good habit. The flowers are broadly bell-shaped, and about 1½ inch across. They are white with brown spots on the upper segments while the anthers are brown. The foliage is very dark green.

To Rose 'Covent Garden' (votes unanimous), from Messrs. B. R. Cant, Colchester. A rich deep crimson Hybrid Tea variety of excellent form, and pleasing fragrance. It is said to be very free-flowering and to continue over a long season. It also forces well under glass.

To Saxifraga 'J. C. Lloyd Edwards' (votes 10 for, 1 against), from Mrs. Lloyd Edwards, Llangollen. A very large-flowered variety of a bright rosy-red colour with a green centre. It belongs to the mossy section and is about 4 inches in height.

To Saxifraga 'Red Dwarf' (votes 9 for, 3 against), from Mrs. Lloyd Edwards, Llangollen. A very free-flowering mossy Saxifrage with deep reddish-scarlet flowers. Its height is from 3 to 4 inches.

To *Schizanthus 'Snowflake'* (votes 6 for, 1 against), from Messrs. Watkins & Simpson, London. A very free-flowering pure white variety of *Schizanthus wisetonensis* of dwarf compact habit.

To Sweet Pea 'Brilliant' (votes 7 for), from Mr. J. Stevenson, Wimborne. A very charming salmon-cerise variety with nicely waved standards.

To Sweet Pea 'Brocade' (votes 10 for), from Messrs. Alex. Dickson, Belfast. A very striking Sweet Pea of a satin-rose-tint shaded mauve, the base of the standard being deeply suffused with mauve. The flowers are very large and well waved, being borne mostly in four-bloomed sprays.

To Sweet Pea 'Hawmark Pink' (votes 10 for), from Messrs. Alex. Dickson, Belfast. A bright rose-pink variety deeply flushed and shaded with salmon. The flowers are of excellent form and beautifully frilled.

To Tulip 'John Ruskin' (votes 6 for), from Messrs. Barr, Taplow. A beautiful soft rose Cottage Tulip, heavily flushed with buff orange. The base is clear yellow.

To Tulip 'Mrs. Kerrell' (votes 5 for, 2 against), from Messrs. Barr, Taplow. A light cerise-pink Cottage variety with light-blue markings at the base round a whitish centre.

To Tulip 'Sophrosyne' (votes 6 for), from Messrs. Barr, Taplow. A large Darwin Tulip of a deep rose-pink colour, with a deep blue base.

To Tulip 'Velvet King' (votes unanimous), from Messrs. Barr, Taplow. A very fine Dutch Breeder Tulip of a dark purple maroon colour, with a white base.

Other Exhibits.

Mr. J. C. Allgrove, Slough: *Papaver orientale* fl. pl. and *Rheum purpureum*. Messrs. Baker, Codsall: Saxifraga 'Crimson King,' and Polyanthus 'Codsall strain.'

Mr. H. Blanchard, Parkstone: *Telopea oreades*.

Messrs. Dobbie, Edinburgh: Sweet Peas 'Pink Pearl' and 'Dobbie's Maroon.'

Mr. C. Elliott, Stevenage: *Viola gracilis* 'Elliott's White' and *Geum Rossii*.

Messrs. Forbes, Hawick: *Dianthus* 'Sunset.'

Messrs. Hobbies, Dereham: Rose 'Green's Climbing Victory.'

Messrs. S. Low, Bush Hill Park: Malmaison Carnations.

R. L. Mond, Esq., Sevenoaks: Calceolarias.

Messrs. W. Paul, Waltham Cross: Roses 'Evelyn' and 'Dowager Countess of Roden.'

Mr. M. Prichard, Christchurch: *Erigeron* 'Bertram Gentle' and *Dianthus neglectus* 'Russell V. Prichard.'

Messrs. Rogers, Southampton: *Retinospora obtusa nana pygmaea*.

FLORAL COMMITTEE, MAY 27, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Alex. Dickson, Belfast, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Aquilegias.

Silver Flora Medal.

Mr. E. J. Hicks, Twyford, for Roses.

To the John Innes Horticultural Institution, Merton, for Calceolarias.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.

To Messrs. Low, Bush Hill Park, for Carnations.

To Mr. J. Stevenson, Wimborne, for Sweet Peas.

Bronze Flora Medal.

To Mr. F. Gifford, Hornchurch, for *Paeonia officinalis lobata*.

Bronze Banksian Medal.

To Miss C. Warner, Hawkhurst, for Rhododendrons.

Award of Merit.

To *Cytisus sessilifolius* (votes unanimous), from Miss Willmott, V.M.H., Great Warley. A very pretty flowering shrub of great hardiness growing from 4 to 6 feet high. Its bright-yellow flowers are borne in great profusion in short erect terminal racemes. The leaves are small, trifoliate and sessile. The plant is a native of Southern Europe.

To *Primula Harroviana* (votes 10 for), from A. K. Bulley, Esq., Neston. The pure white flowers of this charming *Primula* are broadly campanulate, and measure about $\frac{1}{2}$ inch across. They are borne, some pendent, others horizontally, on slender spikes covered with white meal. The height of the plant is about four inches. The leaves are bright green, crenate and about three inches long.

To *Ramondia pyrenaica pallida* (votes unanimous), from Mr. T. Temple West, Redhill. A very vigorous growing pale form of *Ramondia pyrenaica*. The colour of the large flowers is light bluish mauve.

To Sweet Pea 'Hawthorn Maroon' (votes 5 for, 1 against), from Messrs. Alex. Dickson, Belfast. The colour of this variety is deep bronzy maroon, and the flowers are of large size and beautifully waved.

Other Exhibits.

Mr. G. Anquetil, Ightham: *Cistus Goldsmidi*.

Mr. R. Bolton, Birdbrook: Sweet Peas.

Messrs. H. Chapman, Rye: Iris 'Rotherside Gladiator.'

Misses Hopkins, Shepperton: hardy plants.

E. Marsden Jones, Esq., F.L.S., Malpas: hybrid Geums and Cheiranthus.

Mr. C. Turner, Slough: Lilacs.

Mrs. Woodward, Bewdley: *Paeonia Woodwardii*.

FLORAL COMMITTEE, JUNE 17, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—*Silver-gilt Banksian Medal.*

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. Kelway, Langport, for Delphiniums and Peonies.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Peonies, Delphiniums &c.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Rev. J. H. Pemberton, Romford, for Roses.

Silver Banksian Medal.

* To Messrs. Cheal, Crawley, for shrubs, Dahlias, etc.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Wallace, Colchester, for Irises.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Award of Merit.

To *Cheiranthus* 'Pamela Pershouse' (votes 15 for) from Mr. E. Marsden Jones, Tilston Rectory, Malpas. This plant is the result of a cross between *Cheiranthus alpinus* and *C. Allionii*. It is very free flowering and compact in habit. The flowers are deep golden-yellow in colour and measure about an inch across.

To *Cistus* 'Silver Pink' (votes unanimous), from Messrs. Hillier, Winchester. A very charming hardy *Cistus* bearing large bright rose pink flowers measuring 3 inches across. The centre of each flower is occupied by a bunch of golden stamens. The leaves are thick, lanceolate, 1 to 3 inches long, deep green above and greyish green beneath.

To *Lonicera ciliosa* (votes unanimous), from Lady Gurney, Norwich. A perfectly hardy twining Honeysuckle, introduced from Western North America in 1824. The leaves are ovate, 2 to 3 inches long, glaucous beneath, and hairy on the margins. The upper leaves are perfoliate. The flowers are produced

in terminal stalked spikes of several whorls and are about $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long. They are orange-scarlet in colour.

To Pæony 'Lord Cavan' (votes 13 for, 4 against), from Messrs. Kelway, Langport. A large flowered violet-rose variety with a large mass of narrow petaloid stamens of the same colour edged with yellow in the centre.

To Sweet Pea 'Royal Scot' (votes 16 for, 1 against), from Messrs. Dobbie, Edinburgh. The flowers of this variety are large, frilled, salmon-cerise in colour and are borne mostly in fours.

The following Awards recommended by a sub-committee visiting Wisley on June 12, to Herbaceous Pæonies on trial at Wisley, were confirmed.

First-class Certificate.

No. 136, 'Lady Carrington,' from Messrs. Bath.

Award of Merit.

No. 84, 'Devonia,' from Messrs. R. Veitch.

No. 96, 'Solfaterre,' from Messrs. Bath.

Highly Commended.

No. 108, 'Maria Kelway,' from Messrs. Kelway.

Other Exhibits.

Mrs. Burns, Hatfield : Malmaison Carnation 'Mrs. Burns.'

Messrs. Chapman, Rye : Spanish Iris 'Rotherside Blue.'

Mr. C. Elliott, Stevenage : hardy plants.

Misses Hopkins, Shepperton : hardy plants.

Mr. G. W. Miller, Wisbech : hardy plants.

Messrs. Piper, Langley : hardy plants.

Miss Willmott, Great Warley : hardy plants.

FLORAL COMMITTEE, JULY 1, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Cuthbert, Southgate, for Streptocarpus and Gloxinias.

To Messrs. Blackmore and Langdon, Bath, for Delphiniums.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Silver Banksian Medal.

To the Alder River Nursery, Iwer Heath, for Lilies &c.

To Messrs. Kelway, Langport, for Delphiniums.

To Messrs. Ladhams, Southampton, for Pinks &c.

Bronze Banksian Medal.

To Misses Hannen & Courtney, Baldock, for Delphiniums.

Award of Merit.

To Begonia 'General Allenby' (votes 15 for), from Messrs. Blackmore & Langdon, Bath. A very-fine dark scarlet variety.

To Begonia 'King Albert' (votes 16 for, 2 against), from Messrs. Blackmore & Langdon, Bath. A fiery-scarlet variety of excellent form and large size.

To Begonia 'Mrs. J. S. Brunton' (votes 13 for), from Messrs. Blackmore & Langdon, Bath. A beautiful pale salmon-pink variety.

To Begonia 'Queen of the Belgians' (votes 18 for), from Messrs. Blackmore & Langdon, Bath. The flowers of this variety are of very fine form and of a beautiful deep salmon-pink shade.

To Begonia 'Snowdrift' (votes 19 for), from Messrs. Blackmore & Langdon, Bath. An excellent white Begonia.

To Delphinium 'Lloyd George' (votes 16 for, 3 against), from Messrs. Kelway, Langport. The flowers of this Delphinium are large, single, and of a deep-blue colour, shading to purple at the margins. The eye is creamy white and the blooms are carried on a bold though not crowded spike.

To *Erigeron hybridus* 'Elsie' (votes 19 for, 4 against), from Messrs. Ladhams, Southampton. A very decorative hardy plant of nice dwarf habit, bearing very large numbers of large rosy-mauve flowers with yellow centres.

To Poppy 'Bakers' Sunbeam Strain' (votes 15 for, 3 against), from Messrs. Baker, Codsall. A new strain of perennial Poppies having *Papaver nudicaule* for one of its parents. Its flowering period is said to extend from May to October. The colours of the flowers include yellow, orange, and white, and the stems are of great length and strength. The flowers are larger than those of *P. nudicaule* and the plants are very robust in habit.

Other Exhibits.

Messrs. Allwood, Haywards Heath : Carnations.

Mrs. Barnard, Kempston Hoo : Delphiniums.

Mr. R. Bolton, Birdbrook : Sweet Pea 'Commander Godsall.'

Messrs. Cheal, Crawley : flowering shrubs.

Mr. F. J. Fletcher, Ipswich : Violas.

The John Innes Horticultural Institution, Merton : Cheiranthus hybrids.

W. R. Lysaght, Esq., Chepstow : *Phormium Cookianum*. F.C.C., 1868.

Mr. G. W. Miller, Wisbech : hardy plants.

Mr. A. Perry, Enfield : Liliiums.

Mr. T. Rainbow, Dorking : Primula hybrid.

Mr. A. Williams, Jedburgh : Geum.

FLORAL COMMITTEE, JULY 15, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums and Gloxinias.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. Carter Page, London, for Violas.

To Messrs. Paul, Waltham Cross, for Roses.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Rev. J. H. Pemberton, Romford, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Flora Medal.

To the Alder River Nursery, Iver Heath, for Liliiums &c.

To Mrs. Campbell, Reigate, for Sweet Peas.

Award of Merit.

To Delphinium 'F. W. Smith' (votes 16 for), from G. Ferguson, Esq., Weybridge. A bright blue, semi-double variety with a white eye. The flowers are large, long stalked, and well set on a fine spike.

To Delphinium 'Joan' (votes 13 for, 6 against), from Mr. W. Wells, Junr., Merstham. A very pleasing bright-blue variety with a brown centre. The flowers are large, single, and are borne on a good spike.

To Delphinium 'Millicent Blackmore' (votes unanimous), from Messrs. Blackmore & Langdon, Bath. The flowers of this beautiful variety are semi-double and of an attractive lavender shade with a brown centre.

To Delphinium 'Sir Douglas Haig' (votes unanimous), from Messrs. Blackmore & Langdon, Bath. A deep violet coloured variety of large size. The flowers are semi-double and are borne in dense spikes of great size.

To Rose 'Seafoam' (votes 11 for, 3 against), from Messrs. Paul, Waltham Cross. This variety is a seedling from *Rosa bracteata*. It has the habit of this species, and bears large double white flowers tinged with sulphur. The blooms are fragrant and are borne very abundantly.

To Sweet Pea 'Annie Ireland' (votes 20 for), from Messrs. Ireland & Hitchcock, Marks Tey. A charming variety of large size with white wings and blush standard, and an edging of bright pink.

CX PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To Sweet Pea 'Doris' (votes 11 for, 5 against), from Messrs. E. W. King, Coggeshall. A very large-flowered, cerise-pink variety of excellent form.

To Sweet Pea 'Gladys' (votes 19 for), from Messrs. E. W. King, Coggeshall. A charming lavender variety of large size and very fine form.

To Sweet Pea 'Mascott's Scarlet' (votes 15 for, 3 against), from Messrs. Ireland & Hitchcock, Marks Tey. A very handsome large Sweet Pea of a deep scarlet colour.

Other Exhibits.

Mr. Bancroft, Heywood : *Pelargonium* 'Miss Annie Bancroft.'

Mr. G. R. Downer, Chichester : *Delphiniums* and *Gaillardias*.

Messrs. Grove, Sutton Coldfield : *Campanulas* and *Helenium* 'Wyndley.'

Misses Hopkins, Shepperton : hardy plants.

Royal Gardens, Kew : Rose 'Kew Rambler.'

Mr. G. W. Miller, Wisbech : hardy plants.

J. Osborne, Esq., Walton : *Nymphaeas* and *Eleagnus*.

Messrs. Paul, Cheshunt : *Aesculus californica*.

Mr. T. West, Redhill : alpiners.

Miss Willmott, V.M.H., Great Warley : hardy plants.

FLORAL COMMITTEE, JULY 29, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To Messrs. A. Dickson, Newtownards, for Sweet Peas.

Silver-gilt Flora Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Spiræas* &c.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree, for *Pelargonium crispum variegatum*.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Bastin, Bexley Heath, for Begonias.

To Mrs. Campbell, Reigate, for Stocks and Sweet Peas.

To Messrs. Carter Page, London, for Violas, &c.

To Mr. T. P. Edwards, Southgate, for Roses.

To Messrs. Low, Bush Hill Park, for Carnations.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Flora Medal.

To Major Churcher, Alverstoke, for *Gladiolus*.

To Mr. J. Douglas, Great Bookham, for Border Carnations.

To Mr. G. W. Miller, Wisbech, for hardy plants.

To Rev. J. H. Pemberton, Romford, for Roses.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for hardy plants.

To Mr. L. R. Russell, Richmond, for shrubs.

First-class Certificate.

To *Pelargonium crispum variegatum* (votes 18 for, 2 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett), Elstree. This is a very striking sport from *Pelargonium crispum*. It is of rather stiff and erect-growing habit, and is densely clothed with light-green crisped leaves, heavily margined with creamy white. Its foliage is fragrant like that of the type.

Award of Merit.

To *Astilbe simplicifolia rosea* (votes unanimous), from Mr. J. C. Allgrove, Slough. A charming variety of this useful hardy plant differing from the type only in the rose colour of the flowers, the red of the stems, and the slight pink tinge of the foliage.

To *Gentiana Freyniana* (votes 19 for), from Messrs. Baker, Codsall. A strong-growing Gentian, having alternate, opposite, lanceolate leaves and bearing large clusters of dark-blue flowers at the top of the stout erect growths. The inside of the tube of the flower is spotted with purplish spots. The height of the plant is nearly one foot.

To *Gentiana lagodechiana* (votes 21 for, 1 against), from Messrs. Baker, Codsall. A very pretty prostrate Gentian with bright-blue flowers spotted with greyish-brown on the segments of the corolla. The inside of the tube of the flower is whitish and speckled with brown. The leaves are small, ovate, and bright green in colour.

To Sweet Pea 'Market Pink' (votes 8 for, 1 against), from Messrs. Ireland & Hitchcock, Marks Tey. The flowers of this variety are very large and nicely waved. The colour is a good pink with a cream ground showing through at the bases of the standard and wings.

To Sweet Pea 'Mascott's White' (votes 14 for), from Messrs. Ireland & Hitchcock, Marks Tey. A very large pure white Sweet Pea of great excellence

Other Exhibits.

Mr. F. J. Bealing : Geranium 'Rita Bealing.'

Mr. E. Marsden Jones, F.L.S., Tilston : Lathyrus 'Dolly North' and L. 'Fairy Queen.'

Mr. A. Perry, Enfield : *Dianthus latifolius* 'Crimson Bedder.'

Mr. T. Tongue, Tarleton : *Chrysanthemum maximum* var.

Messrs. R. Veitch, Exeter : *Gaya Lyallii*.

Mr. W. Wells, Junr., Mersham : hardy plants.

FLORAL COMMITTEE, AUGUST 12, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—*Silver-gilt Banksian Medal.*

To Messrs. Grulleman, Lisse, Holland, for Gladioli.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Major Churcher, Alverstoke, for Gladioli.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Cheal, Crawley, for hardy plants.

To Rev. J. H. Pemberton, Romford, for Roses.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. W. Wells, Junr., Mersham, for Delphiniums.

Bronze Flora Medal.

To C. Scrase-Dickins, Esq., Horsham, for *Dierama pendulum*.

Award of Merit.

To Gladiolus 'Mrs. Swainson' (votes 11 for, 5 against), from Messrs. Kelway, Langport. A pale-yellow variety slightly flushed with rose towards the tips. It is of the primulinus type and belongs to the section known as 'Langprim Hybrids.'

Other Exhibits.

Mr. G. F. Hallett, Carlisle : P.F. Carnation 'Gracie Hallett.'

Messrs. Hurst, London : *Antirrhinum nanum* grandiflorum 'Sunrise.'

Mr. W. G. Meredith, Leamington Spa : Carnation seedling.

FLORAL COMMITTEE, AUGUST 26, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended :—

Gold Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. L. R. Russell, Richmond, for stove plants.
To Messrs. Van Til, Hillegom, Holland, for Gladioli.
To Messrs. Vert, Saffron Walden, for Hollyhocks.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs and hardy plants.
To Major Churcher, Alverstoke, for Gladioli.
To Messrs. Dobbie, Edinburgh, for African Marigolds.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.
To Rev. J. H. Pemberton, Romford, for Roses.
To Messrs. Velthuys, Hillegom, Holland, for Gladioli.
To Mr. W. Wells, Junr., Merstham, for Delphiniums.

Bronze Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Blackmore & Langdon, for Delphiniums.
To Messrs. Ladhams, Southampton, for hardy plants.

Award of Merit.

To Dahlia 'Coral Star' (votes unanimous), from Messrs. Cheal, Crawley.
A very striking orange-scarlet 'Star' Dahlia with good stiff stems.

To Dahlia 'Stalwart' (votes 8 for, 1 against), from Messrs. Stredwick, St. Leonards. A very large-flowered stiff-stemmed, crimson 'Decorative' variety.
To Dahlia 'Triumph' (votes unanimous), from Messrs. Stredwick, St. Leonards. A bright rosy-cerise Decorative Dahlia which holds its flowers well up above the foliage.

To Erigeron 'Merstham Glory' (votes 22 for), from Mr. W. Wells, Junr., Merstham. A very free-flowering much-branched hardy garden plant of medium height. The individual flowers are pale mauve in colour, and nearly two inches across.

To Gladiolus 'Kelway's Maréchal Foch' (votes unanimous), from Messrs. Kelway, Langport. A very fine bright-scarlet variety, having flowers of medium size borne on a long spike.

To Gladiolus 'Mrs. McAlpin' (votes unanimous), from Messrs. Kelway, Langport. A large-flowered salmon variety streaked with scarlet, and having a pale yellow blotch on the middle lower petals. The flowers are borne in a very fine spike.

To Gladiolus 'White Beauty' (votes unanimous), from Messrs. Kelway, Langport. An excellent white variety of large size with faint purplish violet streaks on the three lower petals.

To Hollyhock 'Lady Bailey' (votes 12 for), from Messrs. Vert, Saffron Walden. A fine, double, pale-pink variety of large size.

To Hollyhock 'Queen of the Yellows' (votes 12 for), from Messrs. Vert, Saffron Walden. An excellent pale-yellow double variety, similar in form to the preceding variety.

Other Exhibits.

Hon. Vicary Gibbs, Elstree : *Dipteronia sinensis*.

Mr. Jarrett, Anerley : Dahlias.

Mr. G. W. Miller, Wisbech : hardy plants.

W. Van de Weyer, Esq., Corfe Castle : hybrid Buddleias.

Messrs. R. Veitch, Exeter : Gladiolus 'Golden Dream.'

Miss E. Willmott, V.M.H., Great Warley : *Zauschneria californica*, Wolley Dod's variety.

FLORAL COMMITTEE, SEPTEMBER 9, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. G. Reuthe, Keston, for hardy plants.

To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs and herbaceous plants.

Award of Merit.

To Dahlia 'Adallus' (votes 6 for, 3 against), from Messrs. Burrell, Cambridge. A crimson-magenta Decorative variety with a silvery reverse to the florets. The flowers are of medium size and are borne on stiff erect stems.

To Dahlia 'Cassiope' (votes unanimous), from Mr. C. Turner, Slough. A good white and scarlet Decorative variety.

To Dahlia 'Iliad' (votes unanimous), from Messrs. Burrell, Cambridge. A large and beautiful variety of the Paony-flowered section. The colour is salmon suffused with buff.

To Dahlia 'Jazz' (votes 6 for, 3 against), from Messrs. Stredwick, St. Leonards. A well-shaped Collerette variety with cream-coloured ray florets and a white collar.

To Dahlia 'Mrs. D. B. Crane' (votes unanimous), from Messrs. Stredwick, St. Leonards. An excellent pure-white Cactus variety.

To Dahlia 'Nanette' (votes 6 for, 2 against), from Mr. C. Turner, Slough. A neat cream-and-yellow variety belonging to the Star section.

To Dahlia 'Raider' (votes unanimous), from Mr. H. Brown, Luton. A yellow Pompon variety of excellent form.

To Dahlia 'Royal Sussex' (votes unanimous), from Messrs. Stredwick, St. Leonards. A good Cactus variety of reddish-scarlet colour.

To *Gentiana Farreri* (votes unanimous), from Mr. W. Wells, Junr., Merstham. A new Chinese species with large clear pale-blue flowers, measuring $2\frac{1}{2}$ inches across at the top. The inside of the tube of the flower is white tinged with green, and the outside is streaked with dark blue and green. The plant is of spreading, prostrate habit and the foliage is very narrow.

Other Exhibits.

F. J. Hanbury, Esq., East Grinstead: hybrid *Meconopsis* (*M. cambrica* × *M. quintuplinervis*).

Mr. G. W. Miller, Wisbech: hardy plants.

FLORAL COMMITTEE, OCTOBER 21, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

First-class Certificate.

To *Pyracantha Rogersiana forma flava* (votes unanimous), from the R.H.S. Gardens, Wisley. A free-branching graceful shrub of spreading habit, bearing bunches of roundish bright golden-yellow fruit in great abundance. The leaves are slightly notched at the margin and are dark olive-green in colour.

Award of Merit.

To Aster 'Rose Queen' (votes 15 for, 3 against), from Messrs. Baker, Wolverhampton. A good rose-pink variety with double flowers.

To *Berberis orthobotrys* (votes 14 for), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A very ornamental shrub, bearing bunches of scarlet, elongated, oval fruits. Each bunch has from 4 to 5 fruits, and each individual fruit is about $\frac{1}{2}$ inch long and $\frac{1}{4}$ inch in diameter. The leaves are ovate in shape, with a spiny margin and have a pleasing bronze tint in autumn.

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To *Chrysanthemum* 'Viscount Chinda' (votes 9 for, 2 against), from Messrs. Wells, Merstham. A large-flowered Japanese variety of a rich golden-yellow colour. The petals are loosely incurved, and the depth of the blooms exhibited was about 8 inches.

To *Nerine Bowdeni alba* (votes 14 for), from Messrs. R. Veitch, Exeter. A pure white variety of *N. Bowdeni* with narrow petals.

To *Nerine* 'Exonia' (votes 13 for), from Messrs. R. Veitch, Exeter. This variety is the result of a cross between *N. Bowdeni* and *N. Fothergilli*. It is a vigorous grower and very free-flowering. The flowers are a beautiful shade of bright cerise-pink.

To *Pyracantha Rogersiana forma aurantiaca* (votes 16 for), from the R.H.S. Gardens, Wisley. This variety, which is similar in habit to the one mentioned above, has reddish-orange berries.

To *Pyrus transitoria toringoides* (votes 14 for, 2 against), from Miss E. Willmott, V.M.H. This small crab Apple was first collected by Mr. E. H. Wilson, V.M.H., in Western Szechuan, in 1904. It is a free-growing tree and has clusters of creamy-yellow fruits flushed with red. The fruits are about $\frac{1}{2}$ inch in diameter, and are suspended on thin pedicels measuring about $\frac{3}{4}$ inch long. The leaves are deeply lobed and very ornamental.

Other Exhibits.

Messrs. Cutbush, Highgate: Asters and Carnations 'Mrs. Lucy Mackinnon.'

Mr. A. S. Dunton, Wolverhampton: *Chrysanthemum* 'Golden Goacher.'

G. Goodsir, Esq., Croydon: Aster 'Miss Edna Goodsir.'

Mr. Hay, Greenwich Park: *Sedum Cavii*.

Messrs. S. Low, Bush Hill Park: Carnation 'Mrs. Thos. Ives.'

S. Morris, Esq., Norwich: fruits of *Lonicera Hildebrandti*.

FLORAL COMMITTEE, NOVEMBER 4, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Gold Medal.

To Lady Ann (gr. Mr. Sharnbrook), Derby, for Begonias.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for Nerines.

To Messrs. Cutbush, Barnet, for Carnations.

To Messrs. S. Low, Bush Hill Park, for Carnations.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

To Messrs. Luxford, Harlow, for Carnations.

First-class Certificate.

To *Nerine* 'Mrs. H. J. Elwes' (votes 10 for, 2 against), from Messrs. Barr, Taplow. This is a variety of great beauty and excellence. The petals are waved and partly reflexed and the colour is a soft delicate shell-pink with silver sheen.

Award of Merit.

To *Chrysanthemum* 'Miss Goodburn' (votes 14 for, 2 against), from Misses Price & Fyfe, East Grinstead. A very dark crimson single variety with golden eye.

To *Chrysanthemum* 'Mrs. F. W. Ladds' (votes 14 for), from Mr. F. W. Ladds, Swanley. A very large golden-yellow Japanese exhibition variety.

To *Chrysanthemum* 'Mrs. W. J. Godfrey' (votes 12 for), from Messrs. Godfrey, Exmouth. A very large pink single variety of excellent form.

To Nerine 'Miss Cecily Elwes' (votes 13 for, 4 against), from Messrs. Barr, Taplow. A very striking variety of a rich mauve colour, with a broad carmine pink stripe on each of the waved petals.

Other Exhibits.

Mr. S. Aish, Dunstable: Chrysanthemum 'Cissbury Pink.'
Messrs. Chapman, Rye: Nerines.
Misses Hopkins, Shepperton: hardy plants.
Mr. J. W. Hussey, Exeter: Chrysanthemums.
Mr. H. Woolman, Birmingham: Chrysanthemum 'Shirley Golden.'

FLORAL COMMITTEE, NOVEMBER 18, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.
To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To F. Galsworthy, Esq., collection of pictures.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Luxford, Harlow, for Carnations.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.
To Messrs. Malby, Woodford, for coloured photographs.

Bronze Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations.
To Messrs. Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Messrs. Barr, Taplow, for Nerines.
To Messrs. Piper, Langley, for shrubs.
To Misses Price and Fyfe, East Grinstead, for Chrysanthemums.
To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Perpetual-flowering Carnation 'Mrs. Walter Hemus' (votes 17 for), from Mr. W. Hemus, Hanworth. A seedling Carnation raised by the exhibitor. The plant is of excellent habit and the stems are stiff and wiry. The flowers are of a beautiful salmon-pink colour, measure approximately three inches across, and have a decidedly good scent. The calyces seldom burst, and the variety has proved an excellent one for market purposes.

To Chrysanthemum 'Barbara Field' (votes 11 for, 3 against), from Capt. M. Drummond, Southampton. This is a pure white seedling Decorative variety of medium size and very free-flowering habit. The plants exhibited were lifted from the open ground and placed under glass for flowering.

To Chrysanthemum 'Percy A. Dove' (votes unanimous), from Mr. A. B. Hudd, Bickley. A beautiful incurved Japanese variety of perfect form and medium size.

To Chrysanthemum 'Princess Mary' (votes 18 for), from Messrs. Wells, Merstham. A big light-yellow incurved Japanese variety of good form. It is a sport from 'Queen Mary.'

Other Exhibits.

Mr. S. Aish, Dunstable: Chrysanthemum 'Cissbury Pink.'
Mr. B. Gaiger, Warwick: Carnation 'Mrs. A. W. Huntington.'
Mr. J. W. Harris, Oxshot: Chrysanthemum 'Mrs. Neville G. Gwynne.'
Mr. W. Holden, Addlestone: Chrysanthemums.
Misses Hopkins, Shepperton: hardy plants.
Miss L. F. Keates, Hursley: Chrysanthemums.
Lord Lambourne, Romford: Chrysanthemum sport.

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FLORAL COMMITTEE, DECEMBER 2, 1919.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. H. J. Jones, Lewisham, for Chrysanthemums.
To Messrs. Wells, Merstham, for Chrysanthemums.

Silver-gilt Banksian Medal.

To Mr. H. Woolman, Birmingham, for Chrysanthemums.

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Lord Lambourne, Romford, for Chrysanthemums.
To Messrs. Luxford, Harlow, for Chrysanthemums.

Silver Banksian Medal.

To Mr. Engelmann, Saffron Walden, for Carnations.
To Messrs. Godfrey, Exmouth, for Chrysanthemums.
To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Bronze Flora Medal.

To Messrs. Blackmore & Langdon, Bath, for Cyclamen.
To Messrs. S. Low, Bush Hill Park, for Carnations.

Bronze Banksian Medal.

To Mr. J. J. Kettle, Corfe Mullen, for Violets.

Award of Merit.

To Bouvardia 'Pink Perfection' (votes unanimous), from Mr. W. Hazelton, gr. to Mrs. Burns, North Mymms Park, Hatfield. This is a very charming bright-pink variety which originated as a sport from a root-cutting of Bouvardia 'President Cleveland.'

To Chrysanthemum 'Lady Astor, M.P.' (votes 13 for, 1 against), from Messrs. Godfrey, Exmouth. A dark-crimson single variety of large size with a golden centre.

To Chrysanthemum 'Mrs. H. E. Dixon' (votes 12 for), from Messrs. Luxford, Harlow. A large Japanese variety with wide florets of yellow tinged with bronze.

To Chrysanthemum 'Sunshine' (votes unanimous), from Mr. G. Carpenter, West Hall Gardens, Byfleet. A very useful decorative variety of medium size and excellent form. The colour is deep orange-amber.

Other Exhibits:

Mr. W. F. Gullick, Salisbury: Chrysanthemum 'Mrs. Lawson.'

Misses Hopkins, Shepperton: hardy plants.

Messrs. Piper, Langley: shrubs.

Mr. G. Reuthe, Keston: hardy plants.

ORCHID COMMITTEE.

MAY 13, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eleven members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for hybrid orchids and rare species.

Award of Merit.

To *Odontoda* 'Zampa,' Rosslyn var. (*Cooksoniae* × 'Coronation') (votes unanimous), from H. T. Pitt, Esq. Flower large and of good shape, red on bright rose ground. Lip bluish-white with red markings around the yellow crest.

Other Exhibit.

A. J. Hollington, Esq., Enfield: *Laeliocattleya* × 'San Juan' (*C. Mendelii* × *L.-c.* × 'Aphrodite').

ORCHID COMMITTEE, CHELSEA, MAY 20, 1919.

Sir HARRY J. VEITCH, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Coronation Cup.

To Messrs. Armstrong & Brown, Tunbridge Wells.

Gold Medal.

To Sir Jeremiah Colman, Bt., Gatton Park, Surrey.

To Messrs. Armstrong & Brown, Tunbridge Wells.

To Messrs. Charlesworth, Haywards Heath.

To Messrs. McBean, Cooksbridge, Sussex.

Silver-gilt Flora Medal.

To Messrs. J. Cypher, Cheltenham.

To Messrs. Flory & Black, Slough.

To Pantia Ralli, Esq., Ashted Park, Surrey.

To Stuart Low, Jarvisbrook, Sussex.

To Mansell & Hatcher, Rawdon, Yorkshire.

Silver Flora Medal.

To Mr. H. Dixon, Spencer Park, Wandsworth.

First-class Certificate.

To *Brassocattleya* × *speciosa*, Gatton Park variety (*C. Schroederae albans* × *B.-c.* × *Digbyano-Mendelii albans*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. Collier). Flowers white, large, and of perfect form.

To *Laeliocattleya* × 'Excelsior,' Ashted Park variety (*C. Mendelii* × *L.-c.* × *Canhamiana alba*) (votes unanimous), from Pantia Ralli, Esq., Ashted Park, (orchid grower, Mr. Farnes). Sepals and petals white, lip rosy-crimson.

To *Sophrolaeliocattleya* × 'Anzac' var. 'General Birdwood' (*L.-c.* × *Dominiana* × *S.-l.-c.* × *Marathon*) (votes unanimous), from Messrs. Charlesworth. Flowers large, brilliant rose-red with a scarlet glow, lip deep crimson.

To *Sophrolaeliocattleya* × 'Anzac' var. 'Lutetia' (votes 19 for, 1 against) from Messrs. Charlesworth. Flowers rather smaller and lighter in colour than the variety 'General Birdwood.'

Award of Merit.

To *Cattleya* × 'The Bride' (*Warszewiczii alba* 'Firmin Lambeau' × *Dusseldorfei* 'Undine') (votes 10 for, 0 against), from Messrs. Flory & Black, Slough. Flowers pure white, three on a spike.

To *Odontoglossum crispum xanthotes* var. 'Princess Mary' (votes unanimous), from Messrs. Charlesworth. A large white form with the usual straw-yellow spots of the xanthotes section.

To *Odontioda* × 'Automa' var. 'May' (*Oda.* × *Bradshawiae* × *Odm. Harryanum*) (votes unanimous), from Messrs. Charlesworth. A large claret-coloured flower, with slight white markings.

To *Odontioda* × 'Dulcies' var. 'Militaris' (*Oda.* × *Cooksoniae* × *Odm. × illustrissimum*) (votes 11 for, 0 against). The plant bore a fine spray of brilliant scarlet flowers.

To *Odontoglossum* × 'Doreen' (*eximium* × 'Empress of India') (votes unanimous), from Messrs. Charlesworth. Flowers large, rich claret with lighter tips to the segments.

To *Odontoglossum* × 'Aphrodite' var. 'Nora' (*eximium* × 'President Poincaré') (votes 12 for, 4 against), from Messrs. Charlesworth. Flowers blotched with violet-purple, with white tips and white front to the lip.

To *Odontoglossum* × 'W. E. Bisset' (*Mars* × *crispum*) (votes unanimous) from Messrs. Armstrong & Brown. Flower large, deep claret-red with clear white margin. Shown as *O. × Brownii*.

To *Odontoglossum* × 'King Emperor' ('Colossus' × *crispum* 'Leonard Perfect') (votes unanimous), from Messrs. Armstrong & Brown. Flowers white, with the inner two-thirds of the segments claret-red.

To *Odontoglossum crispum* 'Linda' (votes 9 for, 3 against), from Messrs. McBean. A good white flower with a few dark spots on the sepals and petals.

To *Brassocattleya* × 'Aida,' Orchidhurst variety (*C. Mendelii* × *B.-c.* × *Digbyano-Mendelii*) (votes unanimous), from Messrs. Armstrong & Brown. A fine white flower with pale-yellow disc to the lip.

To *Odontoglossum* × *eximium* 'Leonora' (*ardentissimum* × *crispum*) (votes 8 for, 4 against), from Messrs. McBean. Flowers bright ruby-red with light-rose margin and white front to the lip.

To *Odontioda* × 'Joan' var. *illustris* (*Oda.* × *Charlesworthii* × *Odm. × ardentissimum*) (votes 8 for, 4 against), from Messrs. McBean. Flowers large, dark chocolate with rose-coloured lip.

To *Odontioda* × 'Orestes' var. 'Thela' (*Oda.* × 'Coronation' × *Odm. × percultum*) (votes 8 for, 3 against), from Messrs. McBean. A good flower with dark-red markings.

To *Odontioda* × 'Gladys' var. 'Invicta' (*Oda.* × *Bradshawiae* × *Odm. Pescatorei*) (votes 19 for, 1 against), from G. W. Bird, Esq., Manor House, West Wickham. Flowers large, bright-rose blotched with maroon-purple.

To *Odontioda* × 'The Dell Duchess' (parentage unrecorded) (votes 12 for, 3 against), from Baron Bruno Schröder, The Dell, Englefield Green. Closely allied to *Oda.* × 'Coronation.' Flowers large, blush-white, closely blotched with red.

Preliminary Commendation.

To *Odontioda* × *Schroederiana* 'Goliath' (*Oda.* × *Bradshawiae* × *O. crispum*) (votes unanimous), from Messrs. Charlesworth. Flower large, light-buff colour.

Cultural Commendation.

To Mr. Farnes, orchid-grower to Pantia Ralli, Esq., for a fine specimen of *Cattleya Mossiae Arnoldiana* with many flowers.

Other Exhibits.

H. S. Goodson, Esq.: *Odontoglossum* × *percultum*, Goodson's variety.

Richard Ashworth, Esq., *Odontioda* × *Brewii*.

Messrs. Sander, St. Albans: *Cymbidium insigne* (Sanderi).

ORCHID COMMITTEE, MAY 27, 1919.

Sir HARRY J. VEITCH, V.M.H., in the Chair, and five members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for hybrids and rare species.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums*, *Odontiodas*, and *Miltonias*.

First-class Certificate.

To *Laeliocattleya* × 'Excelsior' var. 'The Globe' (*C. Mendelii* × *L.-c.* × *Canhamiana alba*) (votes unanimous), from Pantia Ralli, Esq., Ashted Park, Surrey (orchid-grower, Mr. Farnes). A large flower, circular in outline, white, with pale-violet band on the petals, and deep-violet front on the lip.

To *Odontoglossum* × *harvengtense*, Pitt's variety (*crispum* × *triumphans*) (votes unanimous), from H. T. Pitt, Esq. The largest form. Colour pale-yellow with white bases to the segments, the petals and lip having chestnut-red blotches.

Preliminary Commendation.

To *Odontoglossum* × 'Tityus' (*crispo-Harryanum* × 'President Poincaré') (votes unanimous), from Messrs. Charlesworth. Flower large, white, with violet-purple blotches.

Other Exhibits.

H. T. Pitt, Esq., showed two fine specimens of the large Bornean *Coelogyne pandurata*, each with two spikes of emerald-green flowers with black markings on the lip. Also *C. Massangeana*, *C. Dayana*, and *C. speciosa*, and other rare species.

ORCHID COMMITTEE, JUNE 17, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for a group.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for hybrids and interesting species.

Award of Merit.

To *Odontioda* × 'West Point Beauty' var. 'Exquisita' (*Oda.* × *Bradshawiae* × *Odm.* × *eximium*) (votes 11 for, 0 against), from Sir Jeremiah Colman, Bt. Colour deep-red with blush-white markings on the margins of the segments.

To *Odontoglossum* × 'Miguelito' ('Dora' × 'Doris') (votes 11 for, 0 against), from Dr. Miguel Lacroze, Roehampton (orchid-grower, Miss Robertson). A noble flower with heavy violet-purple blotching on blush-white ground. The plant was given a P.C. April 22, 1918, when shown with its first flower.

To *Sobralia* × 'Lyoth' (*macrantha* × *Charlesworthii*) (votes unanimous), from Messrs. Charlesworth. Flowers resembling *S. Charlesworthii*, an ally of *S. Ruckeri*, but habit of plant dwarfer. Colour bright rosy-mauve with crimson lip having a yellow base.

To *Laeliocattleya* × 'San Juan' var. 'Victory' (*C. Mendelii* × *L.-c.* × 'Aphrodite') (votes 13 for, 0 against), from Mr. C. F. Waters, Balcombe. Nearest to *L.-c.* × 'Aphrodite.' Flowers white, tinged with blue, lip purple with yellow base.

Preliminary Commendation.

To *Odontoglossum* × 'Fabia' (*eximium* × 'Aglao') (votes unanimous), from C. J. Lucas, Esq., Horsham. A fine white flower blotched with purple.

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Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bt., for *Dendrobium acuminatum* with five spikes.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for *Bulbophyllum Balfourianum* with 14 flowers.

Other Exhibits.

Otto Beit, Esq.: *Vuytsteheara* × 'Thera' (*M. Warscewiczii* × *Oda*. × *Cooksoniae*).

Messrs. Flory & Black: various hybrids.

ORCHID COMMITTEE, JULY 1, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nine members present.

Awards Recommended:—

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

First-class Certificate.

To *Disa* × *Blackii grandiflora* (*grandiflora* × 'Luna') (votes unanimous), from Messrs. Flory & Black, Slough. Flowers larger than those of *D. grandiflora*, which was the seed-bearing parent. Lateral sepals, broad deep rosy-mauve, galea large, blush-white with a few purple lines; petals yellow, spotted with crimson.

Award of Merit.

To *Thunia* × 'Gatton' (*Bensoniae Winniana* × *Majoriana*) (votes unanimous), from Sir Jeremiah Colman, Bt., Gatton Park (gr. Mr. J. Collier). Flowers in nodding terminal racemes of five or six; each four inches in length, white tinged with mauve; lip purple with raised lines of yellow papillæ.

Cultural Commendation.

To Mr. J. Collier, gr. to Sir Jeremiah Colman, Bt., for a fine specimen of *Aerides odoratum album*, with a spike of forty white flowers.

Other Exhibits.

Dr. Miguel Lacroze: *Laeliocattleya* × *luminosa*, Bryndir variety, and *Odontoglossum* 'La Paz,' a *crispum* *Solum* seedling.

H. T. Pitt, Esq.: two *Dendrochilum filiforme*, each with about fifty spikes, and hybrid *Cypripediums*.

Messrs. Charlesworth: *Odontoglossum crispum* 'Lady Newnes.' A fine white variety of the *xanthotes* class.

Messrs. Flory & Black: hybrid *Disas*.

ORCHID COMMITTEE, JULY 15, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for *Odontiodas*, *Odontoglossums*, *Thunias*, &c.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Dendrobiums*.

Award of Merit.

To *Odontioda* × 'Lyra,' Rosslyn variety (*Odm.* × 'Jasper' × *Oda*. × 'Royal Gem') (votes 11 for, 0 against), from H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood). Flowers large and finely formed, deep claret-red with slight white markings at the tips. Front of lip rose colour.

To *Odontoglossum* × 'Antinous' ('Othello' × *excellens*) (votes 11 for, 0 against), from Messrs. Charlesworth. Sepals and petals ovate, pale yellow with

purple markings on the inner halves. Lip broad white with purple markings at the base.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Dendrobium* × 'Gatton Sunray' (*illustré* × *Dalhouseianum luteum*), and *Dendrobium chrysocrepis*.

Messrs. McBean: *Vuykstekeara* × *bella* (*Oda.* × *Thwaitesii* × *Miltonia Roezlii*), and *Miltonia* × *Hyeana*, McBean's variety.

ORCHID COMMITTEE, JULY 29, 1919.

Sir HARRY J. VEITCH in the Chair, and twelve members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Cattleyas*, *Laeliocattleyas*, and *Odontoglossums*.

Award of Merit.

To *Cattleya* × *illustris* ('*Acis*' × *Maronii*) (votes unanimous) from Messrs. Stuart Low. Flowers bright yellow, with a band of confluent purple lines inside the narrow margin of the lip.

Other Exhibits.

Sir Jeremiah Colman, Bt. (gr. Mr. J. Collier): *Laeliocattleya* × '*Ivernia*,' Gatton Park var. (*L.-c.* × *callistoglossa* × *L. tenebrosa*), with a spike of four large flowers, and specimens of *Zygopetalum Roeblingianum* and *Z. xanthinum*.

Messrs. Stuart Low: hybrid *Odontiodas*, including '*Bridesmaid*' (*Oda.* 'Coronation' × *Odm. Pescatorii*).

ORCHID COMMITTEE, AUGUST 12, 1919.

Sir HARRY J. VEITCH in the Chair, and nine members present.

Award Recommended:—

Silver Flora Medal.

To Messrs. Hassall, Southgate, for *Cattleya Hardyana alba* and other hybrids.

Other Exhibits.

Messrs. Stuart Low, *Odontioda* × '*Black Prince*' (*Odm.* × '*Queen Alexandra*' × *Oda.* × *Charlesworthii*).

Messrs. Hassall: *Laeliocattleya* × '*Muriel*' (*C.* × *Kienlastiania* × *L.-c. callistoglossa*).

ORCHID COMMITTEE, AUGUST 26, 1919.

Sir HARRY J. VEITCH in the Chair, and eleven members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for hybrids and rare species.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for *Cattleyas*, *Laeliocattleyas*, and *Odontoglossums*.

Award of Merit.

To *Cattleya* × *Hardyana alba*, Pitt's variety (*Dowiana aurea* × *Warszewiczii alba*) (votes 8 for, 0 against) from H. T. Pitt, Esq. Sepals and petals pure white, lip large, purplish crimson with yellow disc.

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To *Cypripedium* × 'Rosslyn' (*Godefroyae leucochilum* × 'Rolfi') (votes 9 for, 1 against). A remarkable flower with the markings of *C. Rolfei*. Flowers having broad segments, yellow with dotted lines of claret colour on the petals and dorsal sepal.

Cultural Commendation.

To Mr. Thurgood, gr. to H. T. Pitt, Esq., for *Lasia monophylla* with sixteen scarlet flowers. It was grown suspended in a cool house.

Other Exhibits.

Mrs. Bischoffsheim, Stanmore: *Laeliocattleya* × 'Rubens,' Warren House variety.

Pantia Ralli, Esq.: *Cattleya* × *illustris ashteadensis*.

J. Ansaldo, Esq.: orchid flowers.

R. Windsor Rickards, Esq.: *Cattleya* × 'Mrs. J. Ansaldo,' Usk Priory var.

A. J. Hollington, Esq.: two hybrids.

Messrs. Flory & Black: Cattleyas and *Laeliocattleyas*.

Messrs. Sander: hybrids.

ORCHID COMMITTEE, SEPTEMBER 9, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and ten members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for Cattleyas and *Laelio-cattleyas*.

To Messrs. Stuart Low, Jarvisbrook, Sussex, for hybrids and species.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for Cattleyas and *Odontoglossums*.

Award of Merit.

To *Laeliocattleya* × 'Miranda exquisita' (*Dominiana* × 'St. Gothard') (votes unanimous), from Messrs. Charlesworth. A large flower with deep purplish-mauve sepals and petals, and broad ruby-purple lip with orange lines from the base to the centre.

Preliminary Commendation.

To *Laeliocattleya* × 'Canary' (*L.-c.* × 'Thyone' × *C. Fabia alba*) (votes 8 for, 0 against), from Pantia Ralli, Esq., Ashted Park, Surrey. A small seedling with a bright yellow flower having some red markings at the base of the lip.

Other Exhibits.

C. J. Lucas, Esq.: *Cattleya* × 'Jules Gerard' ('Miss Harris' × *Hardyana*).

H. T. Pitt, Esq.: *Cypripediums*.

Pantia Ralli, Esq.: *Brassocattleya* × 'Olympus.'

Mr. C. F. Waters, Balcombe: *Cattleya* × 'Albion,' Waters' variety.

ORCHID COMMITTEE, SEPTEMBER 23, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and thirteen members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for hybrids and rare species.

To Messrs. Charlesworth, Haywards Heath, for Cattleyas, *Laeliocattleyas* and *Brassocattleyas*.

Silver Banksian Medal.

To Messrs. Flory & Black, Slough, for *Soprocattleyas* and Cattleyas.

To Mr. C. F. Waters, Balcombe, for hybrids.

Award of Merit.

To *Cattleya* × 'Aencas' var. 'Rex' ('Venus' × *Dowiana aurea*) (votes unanimous), from Messrs. Flory & Black, Slough. In shape resembling *C. Dowiana*, but smaller in size. Lip deep yellow, with purple margin.

Other Exhibits.

G. W. Bird, Esq.: two hybrids.

Messrs. Stuart Low: *Sophrolaeliocattleya* × 'Edie Tack' (*S.-l.-c.* × *bletchley-flora* × *C.* × 'Leda').

J. Ansaldo, Esq.: hybrid *Cattleyas* and *Laeliocattleyas*.

ORCHID COMMITTEE, OCTOBER 21, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

First-class Certificate.

To *Brassolaeliocattleya* × *Joiceyi* (*B.-l.-c.* × *Cooksonii* × *L.-c.* × 'Thyone') (votes unanimous), from J. J. Joicey, Esq., The Hill, Witley, Surrey (gr. Mr. J. Mackay). The specific ancestry includes *Cattleya Dowiana aurea*, three times, *Brassavola Digbyana*, *Laelia cinnabarina* and *L. xanthina*, the last instrumental in fixing the bright-yellow colour of the flower. Sepals and petals buttercup-yellow, lip darker yellow, with cherry-red marking on the slightly fringed front lobe.

Award of Merit.

To *Cattleya* × 'Dinah' ('Elvina' × *Dupreana*) (votes 9 for, 4 against), from Messrs. McBean, Cooksbridge. A large and finely formed flower of bright rosy-mauve colour, with purplish crimson front to the lip.

To *Cattleya* × 'Thora' var. *elegans* ('Mrs. Pitt' × 'Empress Frederick') (votes 11 for, 3 against), from Messrs. Charlesworth, Haywards Heath. Flower large, rosy mauve, with bright-yellow disc to the lip.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Laeliocattleya* × 'Lady Moore' (*L.-c.* × 'Epicasta,' Gatton Park var. × *C. labiata*, Glasnevin var.) and *Cattleya* × 'Eleanore' var. 'Lady Mayoress.'

J. Ansaldo, Esq.: *Sophronitis* crosses.

Col. Stephenson R. Clarke, C.B.: *Cattleya Browningiana coerulea*, home-raised.

H. T. Pitt, Esq.: *Odontoglossum grande*, Pitt's variety.

ORCHID COMMITTEE, NOVEMBER 4, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Cattleyas*, *Laeliocattleyas*, and *Odontoglossums*.

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, for hybrids.

Silver Banksian Medal.

To Messrs. Flory & Black, Slough, for hybrids.

To Messrs. C. F. Waters, Balcombe, for *Cattleya* × *Fabia* varieties and other hybrids.

Award of Merit.

To *Cattleya* × 'Enid' *alba* var. 'Fairly Queen' (*Mossiae Reineckiana* × *Warszewiczii* 'Fr. M. Beyrodt') (votes 10 for, 0 against), from J. J. Joicey, Esq., The Hill, Witley, Surrey. Flowers pure white, with yellow disc to the lip, and a narrow purple blotch on the front of the lip.

CXXIV PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

To *Odontoglossum crispum Joiceyi* (votes 8 for, 4 against), from J. J. Joicey, Esq. A fine form of typical white *O. crispum*.

To *Cattleya* × *Pittportia* var. 'Lady Leon' ('Portia' × 'Mrs. Pitt') (votes 9 for, 0 against), from Sir H. S. Leon, Bt., Bletchley Park, Bucks. A good flower, nearest to 'Portia.' The spike bore four deep magenta flowers with chrome-yellow disc to the lip.

To *Laeliocattleya* × 'Honorina,' Orchidhurst var. (*C. Mantinii nobilior* × *L.-c.* × 'Geo. Woodhams') (votes 9 for, 0 against). Flowers bright mauve-purple, with ruby-red lip having gold lines from the base.

Other Exhibits.

Sir Jeremiah Colman, Bt., Gatton: blue *Cattleyas* with *Spathoglottis Fortunei*.

J. D. Wren, Esq., Northampton: *Cypripedium* × 'Ellerdale,' Wren's variety.

Messrs. Hassall: *Brassolaeliocattleya* × 'Thyone' (*B.-c.* × 'Mrs. J. Leemann' × *L.-c.* × 'Thyone').

Frederick J. Hanbury, Esq.: *Cattleya* flowers.

J. Ansaldo, Esq.: orchid flowers.

ORCHID COMMITTEE, NOVEMBER 18, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and nineteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Stuart Low, Jarvisbrook, for *Cattleyas*, *Laeliocattleyas*, and Scarlet *Sophranitis* crosses.

To Messrs. McBean, Cooksbridge, for hybrids, including eight forms of *Laeliocattleya* × 'Linda.'

First-class Certificate.

To *Laeliocattleya* × *Schroederae magnifica* (*L.-c.* × *bella alba* × *C.* × 'Maggie Raphael' *alba*) (votes 10 for, 1 against), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flowers large, pure white, with violet-purple front to the lip.

Award of Merit.

To *Cypripedium* × 'Dixmude' (*Leeanum* × 'Thalia') (votes 8 for, 4 against) from Baron Bruno Schröder. Dorsal sepal green at the base and white above, the median area bearing lines of dark purple blotches.

Other Exhibits.

Sir Jeremiah Colman, Bt.: three blue-tinted *Cattleyas*.

Richard G. Thwaites, Esq.: *Odontioda* × 'Livinia' and *Odontioda* × 'Saturn.'

Messrs. Flory & Black: *Brassocattleyas*.

ORCHID COMMITTEE, DECEMBER 2, 1919.

Sir JEREMIAH COLMAN, Bt., in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Miss M. Walters Anson, Parkstone, for ninety finely executed paintings of new and rare orchids, chiefly in the collection of Lt.-Col. Sir Geo. L. Holford.

Silver Flora Medal.

To Sir Jeremiah Colman, Bt., for blue *Cattleyas*, set up with white *Calanthe* and *Odontoglossums*.

To Messrs. Charlesworth, for *Odontoglossums*, *Odontiodas*, and *Cattleyas*.

To Messrs. McBean, for *Cymbidiums* and *Cattleyas*.

To Messrs. J. Cypher, for *Cypripediums*.

Silver Banksian Medal.

To Messrs. Sander for hybrids and rare species.

First-class Certificate.

To *Laeliocattleya* × 'Bellatrix' (*C.* × *Fabia alba* × *L.-c.* × *bella alba*) (votes 12 for, 0 against) from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower large and broad in all its parts, pure white with claret-purple lip.

To *Odontoglossum* × 'Asion' ('Solon' × 'Aquitania') (votes 11 for, 4 against), from W. R. Fasey, Esq., Snaresbrook (orchid-grower, Mr. E. J. Seymour). Flower of good shape, the inner two-thirds of the segments dark chocolate colour, the outer parts white.

Award of Merit.

To *Brassocattleya* × 'Benvenuto' (*C.* × 'Maggie Raphael' *alba* × *B.-c.* × 'Ilene') (votes 15 for, 1 against), from Baron Bruno Schröder. Flowers pale rosy lilac like the *Brassocattleya* parent, but in form nearer to the *Cattleya*.

Other Exhibits.

The Duke of Marlborough: *Brassocattleya* × *speciosa* var. 'The Hon. Mary Cadogan' (*B.-c.* × *Digbyano-Mendelii* 'Fortuna' × *C. Schroederae alba*).

Messrs. Stuart Low: *Cypripedium* × *Traceyanum* 'Purity.'

NARCISSUS AND TULIP COMMITTEE.

FEBRUARY 11, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and five members present.

No exhibits were before the Committee on this date.

NARCISSUS AND TULIP COMMITTEE, FEBRUARY 25, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and eleven members present.

Mr. P. R. Barr suggested, and it was agreed, that towards the end of the season the question of the revival of the London Daffodil Show in 1920 should be considered.

Award Recommended :—

Cultural Commendation.

To Messrs. Herbert Chapman, Rye, for two bowls of the charming *Narcissus* 'J. T. Bennett Poë.'

Other Exhibits.

Messrs. Herbert Chapman: four pots of *Narcissus* 'Scoutmaster' ('King Alfred' x 'Minnie Hume').

NARCISSUS AND TULIP COMMITTEE, MARCH 11, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and ten members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. R. H. Bath, Wisbech, for a large group of Daffodils and Tulips, grown in pots, in fibre.

Silver-gilt Banksian Medal.

To Messrs. Barr, Covent Garden, for a group of new seedling and other Daffodils, all cut from the open in Cornwall.

NARCISSUS AND TULIP COMMITTEE, MARCH 25, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Bath, for late-flowering Tulips, exhibited in pots, growing in fibre.

Silver Flora Medal.

To Messrs. Bath, for cut Daffodils.

To Messrs. Barr, for cut Daffodils.

Award of Merit.

To *Narcissus* 'Buxted' (votes 12 for, 0 against), a large and finely proportioned yellow Trumpet variety, from Messrs. Bath.

To *Narcissus* 'Golden Cycle' for pots and rock garden (votes 8 for, 0 against), a beautiful golden-flowered hybrid between *N.* 'Golden Spur' and *N.* *cyclamineus*, from Capt. Hawker, Ermington, Strode.

NARCISSUS AND TULIP COMMITTEE, APRIL 8, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and twelve members present.

The Peter Barr Memorial Cup was awarded unanimously to the Rev. Joseph Jacob, for the year 1919-20.

The Engleheart Cup was awarded to Messrs. Herbert Chapman for twelve seedling Daffodils not in commerce.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. Barr for a large and representative group of cut Daffodils.

Silver Banksian Medal.

To Messrs. H. Chapman, for Daffodils.

To W. F. M. Copeland, Esq., Shirley, Southampton, for Daffodils.

Bronze Banksian Medal.

To Major Churcher, Alverstoke, for Daffodils.

It was agreed on the motion of Mr. Copeland that the question of recommending the Council to reduce the registration fee for Daffodils from 2s. 6d. to 1s. be considered at the Society's Meeting next, after the Chelsea Show, and that all members of the Committee be given notice of such meeting.

NARCISSUS AND TULIP COMMITTEE, APRIL 24, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and eleven members present.

It was agreed that the meeting to consider the fee for the registration of Daffodils be held at 11 A.M., on May 27.

Awards Recommended :—*Silver-gilt Flora Medal.*

To Messrs. Barr, for Daffodils.

Silver-gilt Banksian Medal.

To Mr. W. Welchman, Wisbech, for Daffodils.

To Messrs. H. Chapman, for Daffodils.

To Messrs. Bath, for Tulips in pots.

Silver Banksian Medal.

To Messrs. Bath, for Daffodils.

Award of Merit.

To *Narcissus* 'Prince Fushima,' for cutting (votes 7 for, 2 against), from Mr. W. Welchman.

NARCISSUS AND TULIP COMMITTEE, MAY 13, 1919.

Mr. P. R. BARR in the Chair, and ten members present.

The Rev. J. Jacob gave notice of motion "That the Committee be requested to define the term 'Raised by the Exhibitor.'"

Award Recommended :—*Gold Medal.*

To Messrs. Barr, for a very fine group of Darwin and Cottage Tulips.

NARCISSUS AND TULIP COMMITTEE, MAY 27, 1919.

Mr. E. A. BOWLES, V.M.H., in the Chair, and fourteen members present.

The following recommendations were made to the Council:—

- (1) That the expression " Raised by the Exhibitor " be not used in Daffodil Schedules and that " Raised or first flowered by the Exhibitor " be used instead in schedule specifications.
- (2) That the Registration Fee for Daffodils be reduced from 2s. 6d. to 1s.
- (3) That the Narcissus and Tulip Committee be empowered to grant a Preliminary Commendation to new Daffodils represented by one, or more, flowers—as in the case of the Orchid Committee with young seedling Orchids.
- (4) That a Daffodil Exhibition be held and prizes offered in the spring of 1920.
- (5) That there be a meeting of the Narcissus and Tulip Committee at all future Chelsea or other Spring Shows of the R.H.S.

AWARDS TO SUNDRIES, 1919.

INSECTICIDES.

Highly Commended.

Nicotine Soap, sent by Messrs. W. Voss & Co., Millwall, E.
Vixol Saponified Nicotine, sent by Messrs. Vixol, Ltd., Merton Abbey, London.
Sprays for use against sucking insects and young caterpillars. Harmless to foliage.

MILDEW SPRAY FOR ROSE MILDEW.

Highly Commended.

V₈K Fluid, sent by Messrs. Cooper Nephews, Berkhamsted.
Gishurst Compound, sent by Price's Patent Candle Co., Battersea, S.W.

Commended.

A.C.C. Spray, sent by Mr. R. E. Evans, Stratford-on-Avon.
Coffense, sent by Messrs. Lewis Berger, Homerton, N.E.
Summer Wash No. 3, sent by Messrs. Jeyes' Sanitary Compound Co.,
64 Cannon Street, E.C.

CERTIFICATES OF DILIGENT INTEREST IN PLANTS, 1919.

October 29, 1918.—To Tom Webb, for the best kept and best cropped garden plot, Hosey Boys' School, Westerham, Kent.

October 20, 1919.—To Mabel Johnson, for the best kept plot, Waterloo Wesleyan School Garden.

October 20, 1919.—To Annie Lukes, for the best collection of vegetables, Waterloo Wesleyan School Garden.

November 6, 1919.—Albert Jenner, for the best kept and best cropped garden plot, Hosey Boys' School, Westerham.

LONDON CHILDREN'S GARDEN AND RECREATION FUND.

Report.—Messrs. W. A. Bilney and Jas. Hudson, upon the nomination of the Council of the Royal Horticultural Society, inspected the following gardens, under the guidance of Mrs. Lyons, on Friday, July 11th, and submit report as follows:—

Euston Crescent Garden.—This was the first garden to be inspected; it lies near to Euston Station. The ground is not at all favourably situated, being surrounded by dwelling-houses, with the drawbacks consequent thereto in respect to cultivation. Each plot was well cared for, the crops were healthy and the ground was clean. Vegetables were the principal crops, the best being Turnips, Carrots, Onions, and some Kale recently planted. Marginal borders of flowers were arranged around the whole ground; this added to the effect and afforded the children an opportunity of gaining some useful information therefrom.

Equity Gardens.—This ground has similar drawbacks as to its surroundings, whilst the soil is relatively poorer. Here we noted Turnips, Onions, Carrots, French Beans, and some hardy flowering herbaceous plants. The access to this garden is somewhat difficult and steps have to be traversed, hence to get in manure is not at all easy. We noticed, with pleasure, the cleanliness of the small dwelling-houses and their forecourts, with several healthy window plants. A beneficial effect has, beyond doubt, been brought about by this garden in their midst.

Eastnor Gardens.—This plot has only recently been secured, but it bids fair to be a good site. Sufficient time has not elapsed in which to show any return for this season. Seeds have been sown, and a fair start has been made. Good results should follow here another year as the site is a fairly open one.

Stepney Gardens.—Here we noticed with pleasure the very healthy state of the crops. Not a large crop of any kind of vegetable was noted, the aim having been to afford variety, the object no doubt being to inculcate into the minds and memories of the children the advantages of cultivation, which was most distinctly good. The best were Carrots, Turnips, Parsnips, Scarlet Runners, and French Beans, with a few Marrows. More successional crops were also seen.

Ratcliff Gardens.—These gardens (contiguous to Ratcliff Highway) bid fair to become most interesting and highly instructive. Much actual spade work has been put into this plot of ground. When first taken over it was covered with the debris of brick-bats and other refuse from old buildings. The wreckage caused by the enemy air-raids was also painfully manifest in the surrounding buildings. This refuse, valuable in itself for road-making and now available therefor, had to be collected, and is now stacked in odd corners of the plot in cart-loads by the dozen. By dint of unstinted labour the ground is now in good condition. The soil had first to be sifted, but a great deal of mortar rubble passed through the sieves, and has proved invaluable in rendering the ground more porous and in sweetening the soil. During the progress of the work, at a depth of about three feet, it was found that in years past a butcher's slaughter-house had existed on the spot, traces of horns, hoofs, &c., being found. The mistress in charge—Miss Mercer—with the aid of Messrs. Walsh and Daley, two of the masters, has shown great energy in overcoming the difficulties of the surroundings. Crops of the following vegetables were really of excellent quality, and the scholars (both boys and girls) who were present displayed great zeal and showed an intelligent interest in the cultivation of the varied products. More variety was apparent here than in any other garden we had so far visited. Tomatoes were first-rate in a warm sunny position, as also were Carrots, Potatoes, Lettuce, French Beans, Turnips, Beetroot, Spinach, Jerusalem Artichokes, and Parsley—all very healthy. Some flourishing stools of Rhubarb were also in evidence. Flowers, too, were here a very noteworthy feature. One beautiful standard of Lady Gay Rose was in profuse bloom. Michaelmas Daisies were very healthy, so also were Bearded Irises, Veronicas, Montbretias, Mignonette, Ten-week Stocks and other Annuals, as well as Lilacs and Buddleias, &c. On one side where the ground was sloping, Miss Mercer had made a start with rockwork, and some healthy plants were noted; this evidently gave great delight to the scholars. Another season should see this rockwork well covered. No tender plants were

seen. It was noted that the children were bright, clean, and healthy-looking. It was observed that Miss Mercer takes the R.H.S. Gardeners' Diary for a guide.

(N.B.—The gift of a few young plants suited for rockwork would be a great boon to this garden.)

Deptford Gardens.—These gardens were approached from the previous one, by means of the tunnel under the Thames, and are near to the large docks. They were the largest gardens we inspected and were quite open. Mrs. Lyons, however, expressed a fear that this large plot might be taken from them for "improvements"! It is just on the borders of Greenwich, but within the confines of Deptford, being sheltered on one side by a large block of model dwellings under the Peabody Trust, which completely overlook the gardens on that side, and must be the means of unfailing interest to the tenants. Some 100 children are here taught the elements of gardening in an effective manner. The ground is made the most of by narrow walks between the plots, and at right angles with the main walk. All of these were scrupulously clean, and the crops were quite healthy. The best Carrots seen on this tour were found here—they were excellent. Other good crops were of Beetroot, Lettuce, Scarlet Runner Beans, Onions, Radishes, Turnips, Potatos, Parsnips, Vegetable Marrows, and Artichokes. All of these were healthy and not at all overcrowded. Larger plots, too, were noted of several vegetables. These would have an educational value beyond question. Several beds were bordered with Virginian stocks, others with a scarlet Linum. Auriculas were noted as very thriving; so also were Ten-week Stocks, which were excellent. Several groups of Bearded Iris were vigorous and healthy. The scholars here are very keen. As an instance of this, one of the girls had just given up going to Southend for the School Treat, in order that she might work on her garden plot.

Summary.—The hints given when these gardens were first inspected in 1916—and reiterated since—as to the imperative necessity of thinning out vegetable crops, have been well carried out. This fact alone must prove to be of educational value to all concerned. The good that is being accomplished by these gardens must have far-reaching results in the near future. They create and foster a genuine love for the products of the earth in a remarkable degree. The knowledge that is imparted to the children must have most beneficial results throughout their future lives. One never knows where their lot will be cast; it may be in far-off colonies and dependencies of the British Empire.

Great credit is due to the teachers who undertake this voluntary work. If their patience is at times tested, they reap a rich reward in the good instruction they are enabled to impart.

Mrs. Lyons' self-denying labours in this praiseworthy work deserve unstinted thanks and support—a work in which she is greatly interested. She deserves every encouragement that can possibly be afforded, so that further opportunities of extension may be taken advantage of as they arrive.

W. A. BILNEY.
JAS. HUDSON.

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Abbreviations.—cor. = corrected ; il. = illustrations ; introd. = introduction ; pl. = plates ; col. pl. = coloured plates ; frontis. = frontispiece ; portr. = portrait ; enl. = enlarged ; coloph. = colophon ; pref. = preface ; rev. = revised.

- ALLEN, G. The colours of flowers as illustrated in the British flora. London, 1882. il. 8vo. (1)
- AMHERST, A. Bibliography of works on gardening, reprinted from the 2nd ed. of "A History of Gardening in England." London, 1897. 8vo. (1)
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- A student's book on soils and manures. 2nd ed. Cambridge, 1919. il. 8vo. (4)
- RYFF, G. H. Reformierte Deutsche Apothek, darinnen eigentliche Contrafactur der fürnehmsten und gebräuchlichsten Kreütter. . . . Straszburg, 1573. il. fol. (3)
- SACHS, J. VON. Lectures on the physiology of plants, transl. by H. MARSHALL WARD. Oxford, 1887. il. 8vo. (1)
- SANDERSON, E. D., and PEAIRS, L. M. School entomology. An elementary text-book of entomology. . . . 1st ed. New York, 1917. il. 8vo. (4)
- SCULLY, R. W. Flora of county Kerry, including the flowering plants, ferns, Characeae, &c. Dublin, 1916. pl. map. 8vo. (4)
- SEABROOK, W. P. Modern fruit-growing. London, 1918. il. col. pl. 8vo. (4)
- SEAGER, H. W. Natural history in Shakespeare's time: being extracts illustrative of the subject as he knew it. London, 1896. il. 8vo. (1)
- SEWARD, A. C. [*editor*]. Science and the nation. Essays by Cambridge graduates, with an introduction by the Rt. Hon. Lord MOULTON, K.C.B., F.R.S. Cambridge, 1917. 8vo. (4)
- Fossil plants. A text-book for students of botany and geology. vol. 3. Cambridge, 1917. il. portr. 8vo. (4)
- SHAW, W. The practical gardener; containing plain and familiar instructions for propagating and improving the different kinds of fruit-trees, plants, and flowers. . . . The principal articles written by P. MILLER. The whole compiled and arranged by W. SHAW. London, 1805. pref. pl. 8vo. (6)
- SHELFORD, R. W. C. A naturalist in Borneo. Ed. with a biographical introduction by E. B. POULTON. London, 1917. pl. portr. 8vo. (4)
- SIM, T. R. Flowering trees and shrubs for use in South Africa. Johannesburg and Cape Town, 1919. il. col. frontis. 8vo. (4)
- SMITH, A. L. A monograph of the British lichens. A descriptive catalogue of the species in the department of botany, British Museum. Part 1. 2nd ed. London, 1918. il. 71 pl. 8vo. (13)
- SMITH, T. The profitable culture of vegetables, for market gardeners, small holders, and others. New impression. London 1919. il. 8vo. (4)
- SORAUER, P. A popular treatise on the physiology of plants, for the use of gardeners or for students of horticulture and of agriculture. Transl. by F. E. WEISS. London, 1895. il. 8vo. (1)
- SOWERBY, J. Coloured figures of English fungi or mushrooms. London, 1797-1803. 3 vols. col. pl. fol. (12)
- English botany; or coloured figures of British plants, with their essential characters, synonyms, and places of growth. By SIR J. E. SMITH. 2nd ed. arranged according to the Linnaean method, with the descriptions shortened and occasional remarks added. vols. 1-7. London, [1832]-1840. col. pl. 8vo. (6)
- STEBBING, E. P. Commercial forestry in Britain, its decline and revival. London, 1919. frontis. 8vo. (4)

BOOKS PRESENTED, PURCHASED, OR REVIEWED. CXXXIX

- STEBBING, M. E. (Mrs. E. P.) The flower garden and how to work in it. London [1917]. il. pl. 8vo. (4)
- STOPES, M. Botany, or the modern study of plants. Rev. ed. London and Edinburgh, 1919. il. 8vo. (4)
- *STORER, F. H. Agriculture in some of its relations with chemistry. 7th ed. rev. and enl. New York, 1916. 3 vols. 8vo. (3)
- TANNOCK, D. Manual of gardening in New Zealand. With chapters on hardy bulbs and garden foes, by A. E. LOWE; on vegetable and fruit-growing, by W. SINCLAIR, and on rose-growing for exhibition, by R. NICOLL. Auckland, N.Z. . . . Melbourne and London [1917]. il. col. frontis. 8vo. (4)
- TEETGEN, A. B. Profitable herb growing and collecting. 2nd ed. London, 1919. il. 8vo. (4)
- THEOBALD, F. V. Insect enemies of the allotment holder. Wye, 1918. il. 8vo. (4)
- THEOPHRASTUS. Enquiry into plants and minor works on odours and weather signs. With an English translation by SIR ARTHUR HORT. London and New York, 1916. portr. sm. 8vo. (4)
- THODAY, D. Botany. A text-book for senior students. [2nd ed.] Cambridge, 1919. il. 8vo. (4)
- THOMAS, H. H. [editor]. 1,000 gardening hints. London, 1917. il. 8vo. (4)
- Potatoes and root crops. London, 1917. il. frontis. 8vo. (4)
- Profitable small fruits. London, 1917. il. frontis. 8vo. (4)
- The allotment, its preparation, planting, and management. London, 1917. il. frontis. 8vo. (4)
- The beginner's gardening book. London, 1917. il. frontis. 8vo. (4)
- THOMAS, H. H., and ARNOTT, S. Rockeries, how to make and plant them. London, 1917. il. frontis. 8vo. (4)
- THOMAS, H. H., and CASTLE, F. R. Early vegetables. London, 1917. il. frontis. 8vo. (4)
- Tomatoes and salads. London, 1917. il. frontis. 8vo. (4)
- THOMAS, H. H., and GARNER, G. The garden frame, how to make the most of it. London, 1917. il. frontis. 8vo. (4)
- THOMPSON, H. S. How to collect and dry flowering plants and ferns. London, 1917. 8vo. (4)
- TOUMBEY, J. W. Seeding and planting. A manual for the guidance of forestry students, foresters, nurserymen, forest owners, and farmers. 1st ed. New York, 1916. il. 8vo. (4)
- TROUP, R. S. [editor]. The work of the forest department in India. Calcutta, 1917. pl. 8vo. (17)
- TRUFFAUT, G., and COLT, H. Army gardens in France, Belgium, and occupied German territory, their making and management, with plans and directions suited to the garden service of the British and American expeditionary forces. Versailles, 1919 il. pl. 8vo. (18)
- TUBEUF, K. F. VON. Diseases of plants induced by cryptogamic parasites. . . . English ed. by W. G. SMITH. London, 1897. il. 8vo. (1)
- VERSAILLES. Œuvre des pépinières nationales du Touring-club de France. Versailles, 1919. il. 8vo. (18)
- VINES, S. H. Lectures on the physiology of plants. Cambridge, 1886. il. 8vo. (1)
- VOORHELM, G. Traité sur la jacinthe . . . 3me éd. rev., cor., and aug. . . . Harlem, 1773. pl. 8vo. (3)
- WARMING, E. Lagoa Santa. Et Bidrag til den biologiske Plantegeographi . . . avec résumé en français. Kjöbenhavn, 1892. il. pl. 4to. (1)
- WATSON, H. C. Topographical botany. Being local and personal records towards shewing the distribution of British plants traced through the 112 counties and vice-counties of England and Scotland. Thames Ditton, 1873-74. 2 parts. map. 8vo. (19)
- WATTS, R. L. Vegetable forcing. New York, 1917. il. 8vo. (4)
- WEBER, J. C. Die Alpen-Pflanzen: Deutschlands und der Schweiz . . . mit systematisch geordnetem Text von C. A. KRANZ. 3te Auflage. München, 1872. 4 vols. 400 col. pl. 12mo. (6)
- WEBSTER, A. D. Tree wounds and diseases, their prevention and treatment, with a special chapter on fruit-trees. London, 1916. il. pl. frontis. 8vo. (4)
- Seaside planting for shelter, ornament, and profit. London, 1918. pl. la. 8vo. (4)
- Firewoods, their production and fuel values. London, 1919. pl. la. 8vo. (4)

cxl PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

- WHELDALE, M. The anthocyanin pigments of plants. Cambridge, 1916. 8vo. (4)
- WHELLENS, W. H. Forestry-work. London, 1918. il. 8vo. (4)
- WHITING, A. L. Soil biology laboratory manual. 1st ed. New York, 1917. 8vo. (4)
- WILLIS, J. C. A dictionary of the flowering plants and ferns. 4th ed. rev. and re-written. Cambridge, 1919. 8vo. (4)
- WILSON, W. F. David Douglas, botanist at Hawaii. Honolulu, 1919. pl. portr. 8vo. (8)
- WITHERING, W. British plants. The flowering plants and ferns of Great Britain and Ireland . . . compiled for popular use by W. MACGILLIVRAY. 8th ed. London, 1852. il. pl. 8vo. (6)
- WORSDELL, W. C. The principles of plant-teratology. vol. 2. London, 1916. pl. 8vo. (4)
- WRIGHT, W. P. Food, fruit, and flowers. London and Toronto, 1917. il. frontis. 8vo. (4)

DONORS OF SEEDS, PLANTS, BOOKS, &c., TO THE SOCIETY'S
LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1919.

- ALLGROVE, J. C., Langley. Strawberries. For trial.
- BAKER, Messrs., Wolverhampton. Michaelmas Daisies for trial.
- BALLARD, E., Colwall. Michaelmas Daisies for trial.
- BARNES, W., Dudley. Potato 'Early York.' (See p. 360.)
- BARR, Messrs., Covent Garden. Seeds from Sikkim; Cauliflowers; Dwarf French Beans (see p. 316); Lettuces (see p. 334); Turnips and Swedes; Parsleys; Yellow-fleshed Water Melon from Japan; seeds of *Babiana rubro-cyanea*; Potatos (see p. 360); Sweet Corn.
- BARTHOLOMEW, A. C., Reading. Plants and seeds.
- BECKETT, E., V.M.H., Elstree. *Acer Davidii*. Planted in garden; seeds of Forrest's collecting.
- BILNEY, W. A., J.P., Weybridge. "Reichenbachia" vol. i., "Art of Garden Design." Triggs. Placed in Library.
- BIRCH-REYNARDSON, A. H., Penn. R.H.S. JOURNALS.
- BIRD, Rev. M. C. H., M.A., Stalham. Hybrid Lathyrus. Planted in garden.
- BLADENSBURG, Sir JOHN Ross of, K.C.B., Rostrevor. Collection of seeds.
- BLYTHE, Messrs., Church. Lead arsenate paste.
- BOWLES, E. A., M.A., V.M.H., Waltham Cross. *Arundinaria nitida*.
- BROOKLYN BOTANIC GARDEN, New York, U.S.A. Collection of seeds.
- BROOKS, W., Haslemere. Dutch Brown Beans.
- BROWN, Dr. H. T., Kensington. Volumes of the Journal of the Society of Chemical Industry. Placed in Library.
- BROWN, Mrs., Brighstone. Seed of *Lilium philippinense*.
- BRUNNER, MOND, Messrs., Northwich. Cymene. For trial.
- BULLEY, A. K., Neston. Plants for garden.
- BUTTON, C., Upminster. Seeds from Africa, Palestine, &c.
- BURFEE, Messrs., Philadelphia. Dwarf Beans (see p. 316); Lettuces (see p. 334).
- BURROUGHES, T. H., Stamford. Seed of *Anemone alpina*.
- BURTON, R. F., Longmer. Seeds of *Fuchsia Colensoi* and *Angelica gingidium*; Seedling of *Chordospartium Stevensonii*.
- CARTER, Messrs., Raynes Park. Dwarf French Beans (see p. 316); Parsleys; Turnips; Swedes; Lettuces (see p. 334); Cauliflowers.
- CHALICE, Messrs., Plympton. Lettuce 'Chalice's Masterpiece.' (See p. 334.)
- CHITTENDEN, F. J., F.L.S., V.M.H., Wisley. Seed of *Thermopsis fabacea*.
- CLIBRANS, Messrs., Altrincham. Cauliflower 'Very Early Conqueror.'
- CLUCAS, J. L., Ormskirk. Cauliflowers; Potato 'Maghull Kidney' (see p. 360); Marrow 'The Roller' (to be tried).
- COCKS, L., Canada. Seed of *Asclepias cyanea*.
- COGHILL, C. P., Athboy. Potatos. For trial.
- COLLEDGE, J. D., Cobham. Potato 'Bruce's Gamekeeper.' For trial.
- COLVILLE, Mrs., Colne. Botanical pamphlets for Library.
- COOLING, Messrs., Bath. Dwarf Bean 'Ne Plus Ultra.' For trial.
- COOPER & NEPHEWS, Berkhamsted. Cooper's Mildew (V_2 K) Fluid.
- COOPER, PEGLER, Messrs., London. 'Eclair' Knapsack Spraying Pump; Knapsack Sulphuring machine. Vermorite.
- COUSENS, P. H., Swanwick. Strawberries. For trial.
- CRONIN, J., Melbourne. Collection of Australian seeds.
- CROSS, Messrs., Wisbech. Potatos. (See p. 360.)
- CRUMP, W., V.M.H., Malvern. Apples. Planted in garden.
- DANIELS, Messrs., Wymondham. Cauliflower 'May Queen.'
- DAVIDSON, W. D., Belfast. Potato 'Montana.' For trial.
- DAWKINS, A., Chelsea. Dwarf French Beans (see p. 316); Lettuce 'New Summer' (see p. 334); Cauliflower 'Snowball'; Swedes; Potato 'May Queen' (see p. 360.)
- DENT, Major J. W., Wetherby. Michaelmas Daisies. For trial.
- DICKSON, Messrs. Alex., Belfast. Potatos (see p. 360); Turnips; Lettuces (see p. 334); Cauliflowers; Dwarf French Beans (see p. 316); Swede 'Abundance'; Parslæ 'The Hawlmark Curl.'

cxlii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

- DICKSON & ROBINSON, Messrs., Manchester. Parsley 'Extra Curled'; Swedes; Turnip 'Manchester Market'; Cauliflowers; Potatos (see p. 360); Dwarf French Beans (see p. 316.)
- DOBBIE, Messrs., Edinburgh. Dwarf French Beans (see p. 316); Turnips; Parsleys; Potatos (see p. 360).
- DONARD NURSERY Co., Newcastle, Co. Down. *Rhododendron discolor*; collection of shrubs; *Primula helodoxa*. Planted in garden.
- ELEY, C., East Bergholt. *Rhododendron prunifolium*, *R. oblongifolium*.
- ENGLEHEART, G., Rev., Dinton. Seed of *Antirrhinum* 'Furnace.' For trial.
- FIGGIS, G., Uckfield. *Pistacia chinensis*.
- FINDLAY, A., Auchtermuchty. Potatos. (See p. 360.)
- FOX, Sir Francis, Wimbledon. Seed of hybrid *Gladiolus primulinus*.
- GARDINER, J., Perth. Potato 'Coronation.' (See p. 360.)
- GARTONS, Messrs., Warrington. Swedes.
- GAVIN, L., Ellon. Potatos. (See p. 360.)
- GORRINGE, Rev. R. E. P., Sturminster Newton. Bulbs of *Littonia*.
- GUSSOW, H. T., Ottawa. Collection of seeds.
- GUTHRIE, Messrs., Ladybank. Potatos. (See p. 360.)
- HANBURY, Lady, Ventimiglia, Italy. Collection of seeds.
- HANCOCK, T., Mansfield. Hancock's Early Crimson Grooveless Rhubarb.
- HARRAWAY, Messrs., Warminster. Currants for trial, and Raspberry 'Amber Queen.'
- HAVILAND, Miss M., St. Leonards. Seeds of Dutch Brown Bean.
- HEADFORT, Marquess of, Kells. Trees and shrubs for garden.
- HEMINGWAY'S LONDON PURPLE Co., London. Lead arsenate.
- HENSLOW, Rev. G., M.A., F.L.S., V.M.H., Bournemouth. Books for Library.
- HERBERT, Lady Muriel, Salisbury. *Iris Reichenbachii*; *Primula* from Kashmere.
- HOLMES, W. G., Tain. Potatos. (See p. 360.)
- HORNER, G., Wells. Bulbs of *Gagea lutea* and *Galanthus*.
- HOULISTON, J., Dumfries. Potato 'Earliest Challenger.' (See p. 360.)
- HUDSON, J., V.M.H., Acton. "Flora Vitiensis." Placed in Library.
- HUNTLY, Marquess of, Peterborough. Seeds of *Pinus Jeffreyi*.
- INGALL, W., Louth. Potato 'Ingall's Industry.' (See p. 360.)
- JARVIS, Miss M., Weybridge. R.H.S. JOURNALS.
- JENKINS, E. H., Surbiton. *Saxifraga* $\times$ *bursiculata*.
- JONES, E. MARSDEN, Malpas. Hybrid Geums, Lathyrus, and Cheiranthus. Planted in garden.
- JONES, H., Shrewsbury. Black Currants for trial.
- JONES, H. J., Lewisham. Michaelmas Daisies for trial.
- KEEBLE, Dr. F., C.B.E., London. Tomato seed.
- KEEN, C., Woodbridge. Potato 'Keen's Seedling.' (See p. 360.)
- KELWAY, Messrs., Langport. Parsley 'Kelway's Crested Gem'; Swede, 'Kelway's Perfect Model'; Dwarf French Beans (see p. 316).
- KEMBALL, Mrs., Tunbridge Wells. Seeds from India and Palestine.
- KILBURN, Mrs. D., Guildford. Seed of *Pterostyrax hispidum*.
- LACAITA, C. C., London. *Echium rosulatum*, *E. lusitanicum*. Seeds from Darjeeling.
- LAING & MATHER, Messrs., Kelso. Potato 'Mein's Early Round.' (See p. 360.)
- LAING, R. A., Croydon. Seeds and plants of Yellow Poppy from Khartoum.
- LAMBOURNE, Rt. Hon. Lord, Romford. Seeds of Cupressus and Cypress.
- LAXTON, Messrs., Bedford. Potato 'Early Laxton' (see p. 360); Red and Black Currants (on trial); Strawberries (on trial); Blackberries.
- LEARMONT, HUNTER & KING, Messrs., Dumfries. Strawberry 'Loreburn.' For trial.
- LINDSAY, J., Glencarse. Strawberry 'Glendoick Hybrid.' For trial.
- LODER, R. B., Northampton. Campanula 'R. B. Loder.' Planted in garden.
- LOWDER, T., Birmingham. Pea 'Dora' for trial.
- MAGOR, E. J. P., St. Tudy. Seeds of *Sarracenia purpurea*, seedlings of *Gentiana* sp. and *Amphicoma* sp.
- MARSHALL, C. W., Henfield. Seed of Tomato 'Blackstone Reliance.' For trial.
- MAUGER, W., Guernsey. Potatos. (See p. 360.)
- MAW, C. P., Kenley. Bulbs of *Chionodoxa*. Planted in garden.
- MERRYWEATHER, Messrs., Southwell. Red Currants and Rose 'Henrietta.' For trial.
- MICALISTER, A. W., Dumfries. Potatos. (See p. 360.)
- MCCARDELL, Messrs., Manchester. Entol Insecticide. For trial.
- MILN, T. E., Latchford Without. Potato 'Antrobus No. 27.' (See p. 360.)
- MILNE, H. B., London. Graphite Fertilizer.
- MORSE, Messrs., San Francisco. Dwarf Beans. (See p. 316.)

- MOULD, G. H., Ambleside. Strawberry 'Alice Howard.' For trial.
- MURPHY, Messrs., Leeds. Dormantine Winter Wash. For trial.
- NORTH-ROW, W., London. Potato 'St. Malo Kidney.' (See p. 360.)
- NUNN, H. E. A., Woking. Dwarf French Bean 'Woking Wonder.' (See p. 316.)
- NUTTALL, H., Osmondthorpe. Seeds of *Pisum arvense*.
- NUTTING, Messrs., London. Turnips; Parsley; Cauliflowers; Lettuces (see p. 334); Dwarf Beans (see p. 316).
- OSBURN, Dr. C. A. P., Norwich. Seed of *Lilium regale*.
- OWEN, G. M., Worcester. Seed of *Cistus* from hills N. of Baghdad. Specimens of flowers collected in Mesopotamia.
- PARKER, Capt., Bristol. Gladiolus 'Fair Rosamund.'
- PAUL, Messrs. Wm., Waltham Cross. Roses for Mildew resistance trial.
- PEARSON, Messrs., Lowdham. Strawberries. For trial.
- PETERS, W., Leatherhead. Onion 'Peters' Globe Keeper.'
- PHILLIPSON, Rev. F. H., Birmingham. Seedling Potato. (See p. 360.)
- PIRIE, Miss H. G. L., Ripley. Seeds of Papaya.
- POUPART, W., Twickenham. Dwarf French Beans. (See p. 316.)
- PRENTICE, Messrs., Stowmarket. Ichthemic Guano.
- PRICE'S PATENT CANDLE CO., Battersea. Gishurst Compound.
- PRIOR, J., Newport. Raspberry canes. For trial.
- PRIME, H., Hatfield. Strawberries. For trial.
- RAINE, W. F., Moseley. Unnamed Kidney Potato. (See p. 360.)
- RETWICK, Miss L., Croydon. Seed of *Boronia megastima*.
- RICE, Messrs., Cambridge, U.S.A. Onion and Bean seeds for trial.
- ROCHFORD, Messrs., Broxbourne. Seeds of Tomato 'Ailsa Craig Improved.'
- ROGERS, R. B., Launceston. *Larix Potanini*, *Betula* 4087 Wilson.
- ROTHSCHILD, LIONEL DE, Acton. *Primula helodoxa*. Planted in garden.
- ROYAL GARDENS, Kew. Collection of seeds.
- RUYS, R., Dedemsvaart. Michaelmas Daisies for trial.
- SANDERSON, Rev. F., Southwark. Seed of Coralita.
- SCARLETT, J. W., Musselburgh. Potatos (see p. 360); Turnip 'Golden Stone'; Strawberry 'Early Dutch' (on trial).
- SCRASE-DICKINS, C. R., Horsham. *Polygonum campanulatum*.
- SIMPSON, Messrs., Birmingham. Dwarf French Beans (see p. 316); Parsleys; Cauliflowers; Turnips; Swede 'Laing's Garden'; Lettuces (see p. 334); Potatos (see p. 360).
- SMITH, Messrs., Aberdeen. Potato 'Glenkindie Early.' For trial.
- STEVENSON, T., Uxbridge. Dwarf French Bean 'Osborne's Forcing.' (See p. 316.)
- STOKES, Messrs., Trowbridge. Strawberry 'Twentieth Century.' For trial.
- SUTTON, Messrs., Reading. Lettuces (see p. 334); Dwarf French Beans (see p. 316); Turnips; Swedes; Parsleys; Cauliflowers; Potatos (see p. 360).
- SYDENHAM, Messrs., Birmingham. Turnips; Swede 'Purple Top Garden'; Parsley 'Mossy Curled'; Lettuces (see p. 334); Cauliflowers; Dwarf French Beans (see p. 316).
- TELFER, A. E. C., Liverpool. Seeds for wild garden.
- THORBURN, Messrs., New York. Dwarf Beans (see p. 316); Parsley 'Champion Moss Curled'; Swede 'Naylor's Ruta Baga.'
- TIGWELL, H. D., Greenford. "Sweet Pea Year-Book." Placed in Library.
- TOOGOOD, Messrs., Southampton. Potato 'Crown Jewel.' (See p. 360.)
- TOTTLE, W. H., Plymouth. Potato 'Pessell's Perfection.' (See p. 360.)
- TRESEDER, Messrs., Cardiff. Dwarf French Bean 'Treseder's Premier.' For trial.
- TRINDER, G., Fleet. Black Currant 'Trinder's Long Bunch' for trial.
- TUCKER, Messrs., Oxford. Plants for rock garden.
- UPPSALA BOTANIC GARDEN, Sweden. Collection of seeds.
- VEITCH, Messrs. R., Exeter. Bulbs of *Nerine Bowdenii* hybrids. Parsleys; Swede 'Laing's Garden'; Turnips; Cauliflowers; Lettuces (see p. 334); Dwarf French Beans (see p. 316); Potatos (see p. 360).
- VERSCHOYLE, A., Ascot. "Stirpes Surinamenses Selectae." Placed in Library.
- VOSS, Messrs., Millwall. Vossolite, Bordorite, and Arsenate of Lead. For trial.
- WARRY, W. A., Guernsey. Dwarf French Bean 'Guernsey Wizard' (see p. 316).
- WATKINS & SIMPSON, London. Lettuces (see p. 334); Cauliflowers; Parsleys; Turnips; Dwarf Beans (see p. 316); Swede 'Nonsuch Purple Top.'
- WEBB, Messrs., Stourbridge. Cauliflowers; Turnips; Lettuces (see p. 334); Parsleys; Potatos (see p. 360); Swedes; Dwarf French Beans (see p. 316).
- WELLS, Miss. Seeds of *Lunaria*.
- WELLS, W., jun., Merstham. Michaelmas Daisies for trial.

cxliv PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

WEST, T. TEMPLE, Redhill. *Campanula Zoysii*, *Schizocodon ilicifolia*. Planted in garden.

WHITE, F. B., Southampton. Strawberry 'Sturton Cross.' For trial.

WILKS, Rev. W., M.A., V.M.H., Shirley. Seed of Pe-Tsai améllorée; cuttings of Caraway-scented Thyme; seed of *Anemone sulphurea* and *Vicia sylvatica*; Shirley Poppy seed (for distribution); seed of *Pyrola rotundifolia*; "Garden First" (placed in Library); *Camassia esculenta* 'Steel Blue.'

WILLIAMS, J. C., Gorran R.S.O. Seed of *Rhododendron punctatum* and *R. calendulaceum*. Seeds from Wilson's Corea and Formosa Expedition; miscellaneous seeds.

WILLIAMSON, Mrs., Weybridge. Seeds of Pumpkins and Squashes from S. America.

YOKOHAMA NURSERY Co., London. Japanese vegetable seeds.

ROYAL HORTICULTURAL SOCIETY'S WAR RELIEF FUND.

MANY of the Fellows having contributed to this special Fund, we think the following particulars, showing how the amounts received have been utilized, will prove of interest.

RESTORING THE BATTLEFIELDS.

BRITISH HELP FOR THE ORCHARDS AND GARDENS OF OUR ALLIES.

To anyone who has served in France or Belgium, or indeed on any of the fronts, the terrible devastation of the artillery fire stands forth as the almost heart-breaking feature of the landscape. How to replant and bring the countryside back to normal conditions is indeed a problem of far-reaching magnitude. Well might excuses be found for those small farmers and peasant holders who despaired of being able, during their lifetime, to undertake the work effectively. Nor, let it be said, could a problem of such importance be attacked successfully by the individual alone. There had to be help and co-operation. All this was seen very early—long before the close of the war—by prominent horticulturists in this country, and as an outcome the Royal Horticultural Society War Relief Fund was started. Its object was, firstly, to collect money; secondly, to spend it on trees and seed and horticultural implements; and thirdly, to distribute gifts in such a manner as would confer the greatest benefit on the largest number of individual holders of the devastated ground. Fortunately for success, Lord Grenfell, President of the R.H.S., accepted the Presidency, to be succeeded by Lord Lambourne, and Lady Northcote became Lady President, while Sir Harry J. Veitch not only served as Hon. Treasurer, but gave invaluable assistance when the time came for the purchase of trees and seeds. Mr. Carl Hentschel later on became Secretary, and testimony to his organizing ability has been borne by Lady Northcote herself.

The funds collected amounted to nearly £45,000 (of which £5,000 was collected by Scotland), and to give an account of their stewardship, the Executive Committee met a few days ago at the house of Lady Northcote in St. James's Place. Among those also present were Lord Lambourne (President), Miss Balfour, Sir Harry J. Veitch (Hon. Treasurer), Mr. F. J. Hanbury (Chairman), Lady Margaret Boscawen, Mrs. Henshaw, Mr. H. M. Collinson, Mr. Reginald Cory, Sir Albert Rollit, Mrs. Brodie of Brodie, Lady Dynevor, Lady Margaret Macrae, Lady Jersey, Lady St. Cyres, and Mr. Carl Hentschel, C.C., the Secretary.

From the report made by Mr. Hentschel, it appeared that altogether about 50,000 fruit trees, 48,000 tools, and 400,000 packets of seeds

were distributed under the ægis of the British Section of the French Red Cross. In addition, Belgium received £5,500 for the manufacture of paillassons, while Serbia and Roumania were given great assistance.

Finance.

Sir Harry Veitch reported on finance. He said that the total collected was upwards of £43,000, of which £21,000 was raised during the past fifteen months. All the money was being disbursed with the exception of a sum that they were keeping in hand to replace trees which for some reason or other had not grown. Out of 50,000 trees there were bound to be some failures.

Gratitude.

Perhaps the real story of the success of the Fund was contained in a letter from one of the distributors in France, who wrote:—

VITRY-EN-ARTOIS,
March 24, 1920.

DEAR MRS. HENSHAW,

Will you please excuse pencil, but I am really writing to you in bed at night. I feel that I must let you know at once what a happy day we have had with the trees.

Twelve lorries reached us yesterday evening, too late to get them all unloaded. They lined up on the road outside and one or two of the drivers kept watch all night. You can imagine what a sensation they caused in this devastated place. We slept all the drivers here on mattresses on the floor, but they had their evening meal outside in one of the cafés.

We were all early astir this morning. The unloading was commenced shortly after 7 A.M. and the trees piled up in our garden. We were fortunate in having such a nice open space to put them in, because some of them are huge, especially in length—splendid five-year-old trees. Before the unloading was finished the distribution had begun, and long before midday three of our largest villages—Brebères, Beache, and Corbehun—had received their trees. I took the precaution of letting the Maires know last night that the trees had arrived and that we should be out with them soon after 8 o'clock—so the people were all ready to receive them, each one with a *bon* (or rather, a representative from each family) which they gave up as they received their tree. Miss Lofts did Beache, Miss Robertson Brebères, and Mrs. Winston Corbehun.

Meanwhile the unloading of the remaining lorries went on here. I had managed to get some men from one of the labour camps to help, and it was all finished and the lorries ready to leave soon after 10 o'clock. We gave all the men large bowls of *café au lait* and biscuits, and some tinned meat and cigarettes to take away with them—also a pipe all round as a souvenir; and they went away so pleased and satisfied. Their chief thanked me very much for the hospitality they had received, so I think that was all right.

This afternoon we had a great fête, for Vitry itself, and each family received its garden tools, seeds and tree—also one sheet each and two tins of food.

As soon as the lorries had gone, we started to prepare, everyone available taking part. All our goods were arranged outside—the tinned stuffs on a table at the right of the store-room door, the sheets and seeds on a table on the left—then the trees and the tools displayed in a corner opposite. Then we put up a barricade of rope from the gate, right up the middle of the court to the beginning of the garden, so that the people were obliged to pass in and out in order. Then we put our flags up—British, French, and Canadian—and the place looked quite gay and festive. I sent a note round to the Maire asking him if he would kindly send round the town crier announcing our distribution, and by the time we had our lunch here the people were waiting at the gate.

At 1.30 the show commenced, and everyone was at her post. Miss Miller and Miss Ogle were gate-keepers and controlled the crowd. They were simply

splendid. Only those who had *bons* were allowed to pass through and only a few at a time. It was such a happy, well-behaved crowd, they kept in line and just did as they were told. Little Miss Bruges took the *bons* and gave each one a green ticket for the tree. Miss Clifford presided at the food stall, and that was given first, then on to Miss Robertson for a sheet and a box of seeds. Mrs. Winslow and Miss Chalmers presented the trees, and then they came round the circle and got the tools—two different kinds—from Miss Inglis and Miss Lofts.

It was a most wonderful sight, I wish you could have seen it. The trees were so big and so long that they were not very easy to manipulate, and there was a lot of fun and laughter over it. The two Sisters were very kind in helping the old people to get their trees outside the gate. Some poor old things could scarcely carry themselves, far less a tree and two garden tools, but they would never consent to leave anything behind. We finished up by 4 o'clock, and I don't think there was a hitch. A few came and said they had been forgotten, but these are to be attended to to-morrow morning.

I took a little tour round the village this evening and found quite a number of the trees planted and holes being dug for the others.

It is wonderful the little gardens one finds in amongst the ruins. I don't think there is a family that has not a garden of some kind.

To-morrow we shall have another big day, and right on until all the trees are delivered.

With kind regards,

Yours very sincerely,

(Signed) FLORENCE B. JACK.

Such was the scene which was repeated in the twelve districts in which the distribution took place.

Officially the story of the distribution was told in less romantic language by Mrs. Henshaw in the following report :—

In accordance with the arrangement made, the British Committee of the French Red Cross very gladly undertook to place its organization in France at the disposal of the R.H.S. War Relief Fund for the distribution of fruit trees, garden implements, and seeds in the devastated regions of France. More than the usual crop of difficulties has been encountered in carrying out this work. The distribution of the seeds was a comparatively simple matter, and, as the supplies were received in good time, the distribution has been effected personally by the ladies of our Relief Sections, who have received innumerable tokens of gratitude from the people, to whom will thus be ensured a good supply of vegetables for the coming season. The supply of implements by the makers was greatly delayed and delivery impeded by dock congestion and by the railway strike in France. In spite of this, a great proportion of the implements have been distributed from the different sections, and received with acclamation by the people in the devastated regions. The later consignments of implements were too late to be received and distributed by the personnel of the sections which are to be demolished early in April. These consignments have therefore been sent to the British Committee's Central Store at Compiègne, and will be despatched from there by motor lorry for distribution by the Maires in the different villages to which they are destined. The fruit trees presented the most difficult problem. They have proved to be much larger and heavier than was anticipated, and being beyond the transport resources of the British Committee, the motor lorries of the latter have been supplemented by those of the French Government, which were hired for the purpose. The letter of March 22 from our Paris representative, Captain R. E. MacDonnell, to Mr. Hentschel gives in full detail the arrangements made for the transport of the trees from the nurseries. The successful outcome of these arrangements is due to the indefatigable efforts of Captain MacDonnell and his staff. Later reports go to show that the trees have been delivered safely to their final recipients and have, as in the case of the seeds and implements, been received with almost pathetic gratitude to the R.H.S. War Relief Fund, which, by its generous action, has put the final crown to the great international mission of the British Committee in its relief work in the devastated regions of France. The vegetables raised from these seeds, the garden implements in their daily use, and the trees as they grow, blossom, and bear fruit will be a precious souvenir to France of the good-will and sympathy of her greatest Ally.

cxlviii PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

LE CHEF DE SECTION DU COMITÉ BRITANNIQUE DE LA C.R.F.
(SERVICE DES BLESSÉS ET RÉFUGIÉS),
MOURMELON-LE-GRAND (MARNE).
March 24, 1920.

LADY NORTHCOTE,
Présidente, R.H.S. War Relief Fund.

DEAR LADY NORTHCOTE,

I have to thank you very much for your great kindness in supplying my Section with 7,000 fruit trees.

The trees arrived in two lots, 3,500 from Angers, very fine ones which we distributed in bundles of five to each family, then we got 3,500 from Metz, which were also nice and strong, and we got them out in two days—the people were delighted with them. We have seen a good many of them planted and they look very well.

I had hoped to send you a photo of them, but they are not yet printed.

Thanking you again,

Yours sincerely,

(Signed) J. F. EASTWOOD.

BRITISH COMMITTEE OF THE FRENCH RED CROSS,
SECTION I,
SERVICE DES BLESSÉS ET RÉFUGIÉS,
MAIGNELAY,
OISE.

April 2, 1920.

DEAR MADAM,

The magnificent gifts from the Royal Horticultural Society's War Relief Fund have been immensely appreciated in this section of our work; 50 villages of the Oise and Somme have benefited by the autumn seeds, agricultural and gardening implements, cottage garden collections and fruit trees; you will receive many grateful letters from the maires of these villages, as the people are absolutely delighted and most thankful.

Yours very truly,

(Signed) N. ELIZABETH YEATHERD,
Chef de Section.

It has been a great pleasure to us to distribute these much-needed things.

Perhaps it should be added that over 100 letters from the local Mayors of the various districts helped have testified in no unstinted manner to the work done.

The following extracts from a few of the letters tell their own story:—

St. Quentin.—"The country people here are devoted to their gardens and orchards. . . . They love their fruit trees too, and will almost weep when they describe how the Germans destroyed some of them intentionally, and left others which were afterwards killed by poison gas. . . . Everybody is toiling to bring the land back into cultivation."

Coulommès-la-Montagne.—"A letter of thanks, signed by all the villagers individually, 'to let you know the gratitude of them all and their children. They want not us to be hungry,' they told me in good smiles."

Godenvillers.—"I can assure you that your efforts have been most successful, and that you have gained an affection for England that will be lasting."

Remangies.—" . . . The inhabitants will never forget what their friends in Great Britain have done for them, but will keep their thoughtful kindness in undying memory. . . ."

L'Ecaille.—"You could not possibly have found anything better suited to our needs."

Asfeld.—"The Society may rest assured that the gift which is so generously sent was warmly welcomed by our hard-working people."

Vieux-les-Asfeld.—"The seeds which have reached us at the most propitious moment will be of the greatest service."

Mont Saint Germain.—" . . . How welcome was the gift, and how great is our admiration for the disinterested kindness which prompted you to send

it! It is a truly striking example of brotherhood from one people to another which will continue in a peace a union that was begun in war."

Bulham (Ardennes).—"The Ardennais have good memories, and they will never forget."

Hautregville (Rheims).—"In the name of 225 inhabitants (out of 500) who have returned, I have the honour and the pleasure of thanking you for the splendid and generous gift which your Society has made by sending to each family two large and three small trees. . . . For long years, it may be for many generations, these fruit trees and their kind donors will be held in remembrance at Hautregville."

From a Child at St. Hilaire-le Petit.—"Having received some packets of seeds 'as a proof of friendship through the Committee at Mourmelon,' a little French girl from the devastated regions sends her heartfelt thanks to the Society" (the letter begins "Dear friends across the water").

St. Masmes (Marne).—"We will never forget what we owe to your Society and to all your compatriots who came to our help during the war."

Saint Martin l'Heureux.—"We are greatly touched by the disinterested help that you have sent us, and by the generous impulse which prompted you to come to our assistance."

Prosnès.—"The fruit trees will bring a little greenery to our poor naked devastated village—which was razed to the ground—and will help to brighten up the houses that are being gradually built."

To the British helpers Lady Northcote paid tribute. She said that before the Committee separated she felt that they ought to express gratitude to those who, by their devotion to the cause, had enabled them to accomplish so much. She would like to mention Miss Balfour, who had worked unremittingly. Mrs. Lowther also deserved thanks. A great deal of the success was due to Sir Harry Veitch, without whose expert assistance they would indeed have been at a loss. Mr. Carl Hentschel had devoted his energy and organizing ability in a magnificent way to the Fund. She did not think they could have managed at all without him.

Lord Lambourne, on behalf of the Royal Horticultural Society, thanked Lady Northcote for her work, and said that the Committee desired to express not only admiration but gratitude. Lady Northcote had thrown herself into the work with zeal and enthusiasm.

Royal Horticultural Society War Relief Fund

17 Victoria Street, S.W. 1

Devastated Districts in France in which have been distributed Seeds, Tools & Fruit Trees

WITH THE ASSISTANCE OF

The British Committee of the French Red Cross

French Red Cross Centres :

Seeds, 240,000 packets Tools, 26,000	{	Douai	(Nord)
		St. Quentin	(Aisne)
		Soissons	(Aisne)
		Vouziers	(Ardennes)
		Mourmelon	(Marne)
		Maignelay	(Oise)

Other Districts, where distribution has taken place through other agencies of Seeds, Tools, etc., supplied by our Fund:

Seeds, 140,000 packets Tools, 11,000	{	Ardennes	
		Soissons	(Aisne)
		Coulommès	(Marne)
		La Bassée	(Nord)

Belgium and Yser District.	(£5,000 Paillassons and £500 seeds)
Serbia	(10,000 Packets Seeds and £1,000 per Serbian Relief Fund)
Roumania	(10,000 packets Seeds and 10,000 Tools)

Total Number of Tools about 48,000
(Approximate weight 55 tons. All purchased in Great Britain.)

Total Number of Fruit Trees about 50,000
(Obtained in France in order to ensure suitable kinds, and to avoid the great expense of transport and packing.)

Total Number of Packets of Seeds about 400,000
(Nearly all purchased in Great Britain.)

ROYAL HORTICULTURAL SOCIETY'S WAR RELIEF FUND. cli

Each tool and every box and packet of seeds is labelled as follows, as also every lot of fruit trees :

" OFFERT PAR LES ANGLAIS EN GAGE D'AMITIÉ !

" Royal Horticultural Society War Relief Fund,
" 17 Victoria Street, London."

Everything sent from Great Britain was delivered to the office of the British Committee of the French Red Cross in London, who conveyed all free of expense to our Fund (subject to transport expenses incurred outside their jurisdiction) to the various districts in France named above where the French Red Cross has branches and where every assistance was given by their staff to ours in the distribution to the right people.

Extract from letter dated 13th September, 1919, from Monsieur A. De Smet, President of the *Chambre Syndicale des Horticulteurs Belges*, Ledeberg Gand, *Chaussée de Bruxelles* 92.

" We will be able to help all who want *paillassons*, and I must say this has made in Belgium an enormous sympathy for the English Nation, as the distribution has been made all over Belgium."

N.B.—It is gratifying to be able to announce that last month a representative of the *Chambre Syndicale des Horticulteurs Belges* was officially deputed to visit London and to bring as a *Souvenir* of the gratitude of the Belgian nation a beautiful album stating how the *paillassons* had been distributed throughout the country, and also to express personally the grateful thanks of the recipients.

4 CROMWELL PLACE, S.W. 7.
February 3, 1920.

LÉGATION DE ROUMANIE,
LONDRES.

SIR,

In conformity with the contents of your letter of 17th January, addressed to Monsieur Gologan, I have the honour to acknowledge, on behalf of my Government, receipt of the generous gift of tools and seeds that the Royal Horticultural Society has so kindly made to Roumania, and to ask you to be good enough to convey to your honourable Committee the lively thanks of the Roumanian Government for the assistance so readily given to our cultivators for their economic recuperation.

I regret being unable to give detailed information regarding the use the tools and seeds were put to, but, from instructions given by the Ministry of Agriculture, they were sent to Peasant Co-operative Unions for distribution to their members as a gift from the Royal Horticultural Society of England.

Yours very truly,

(Signed) M. B. BOERESCU,
Roumanian Chargé d'Affaires.

Mr. CARL HENTSCHEL, *Organising Secretary*,
Royal Horticultural Society War Relief Fund,
17 Victoria Street, S.W. 1.

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